THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXVI. No. 638.] LONDON, AUGUST 3, 1875. [27TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.
The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.
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Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

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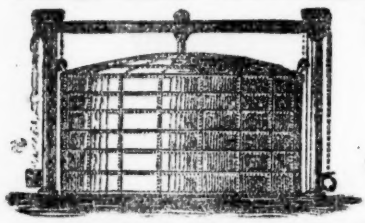

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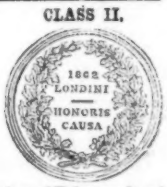
1862.

PATENT ANTIMONY PAINT.

CLASS II.



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This Paint having been in general use over thirteen years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced or resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

The following Gas Companies in London have used the Paint for years—viz., The Gaslight and Coke, Imperial, Independent, City of London, Commercial, London, and Surrey Consumers.

N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.

SPECIAL DRIERS FOR ANTIMONY PAINT SUPPLIED.

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THE "LIGHTNING" SCREW-PLATE.

It is warranted to do five times the work possible with any other screw-plate.

The threads cut with it are far more perfect than can be made with any other hand tool.

It finishes its work at one cut.

The dies are adjustable for wear.

Nuts and bolts threaded with it always correspond, without trying and matching.

THE CHASE'S PIPE-SCREWING AND CUTTING MACHINE.

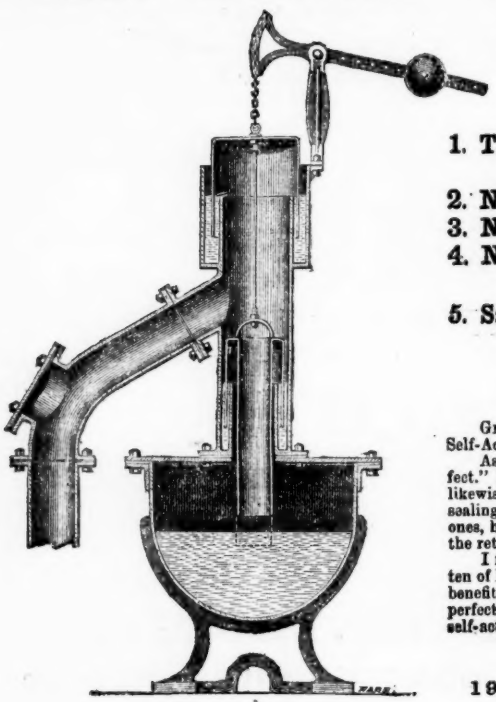
It threads, cuts off pipes, and makes nipples, from $\frac{1}{8}$ in. up to 2 in.

The Splitting of Pipe is entirely avoided.

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

TESTIMONIAL.

Metropolitan District Asylum, Caterham, Surrey, Dec. 14, 1874.

MESSRS. CHANDLER AND STEVENSON.

GENTLEMEN,—I have much pleasure in bearing testimony to the complete working of your "Patent Self-Acting Dip-Pipes," which have now been in constant operation over three months.

As regards the action of the apparatus, I can describe it no better than by calling it "simply perfect." Immediately the retort is charged and the lid secured, the small holder rises, which lifts the Dip; likewise the instant the gas is permitted to escape at the mouthpiece the holder falls, thus perfectly sealing the Dip. I am fully convinced of the superiority of these Self-Acting Dips over Non Self-Acting ones, having experienced the fact that stokers do occasionally neglect to unseal the Dip after charging the retort, thereby causing a waste or loss.

I feel that it is quite unnecessary for me to say more on the subject, excepting that, having had ten of Messrs. Chandler's Dip-Pipes in use more than one year, and having experienced the great benefits derived thereby, inasmuch as the yield of gas from the coal is greatly increased, and the retorts perfectly free from carbon and other advantages, and seeing that the same Dip has been made perfectly self-acting by the second patent, I feel convinced that this is the right thing.—Yours obediently,

W. CRICKMAY, Resident Engineer.

For terms of use and cost, apply to Mr. G. W. STEVENSON,

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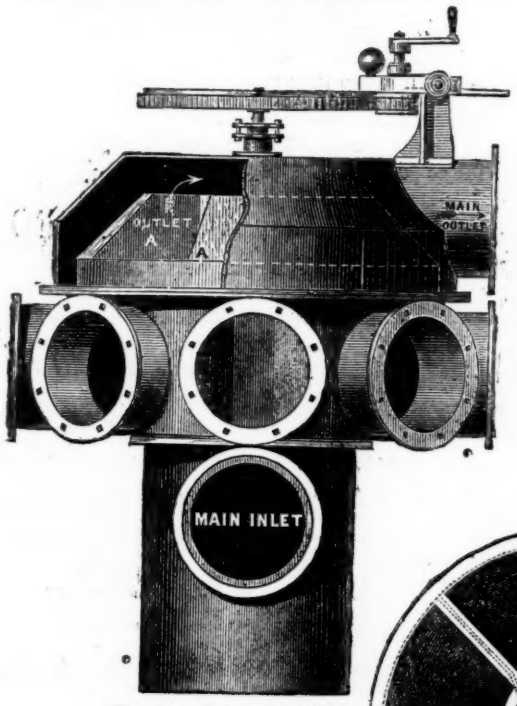
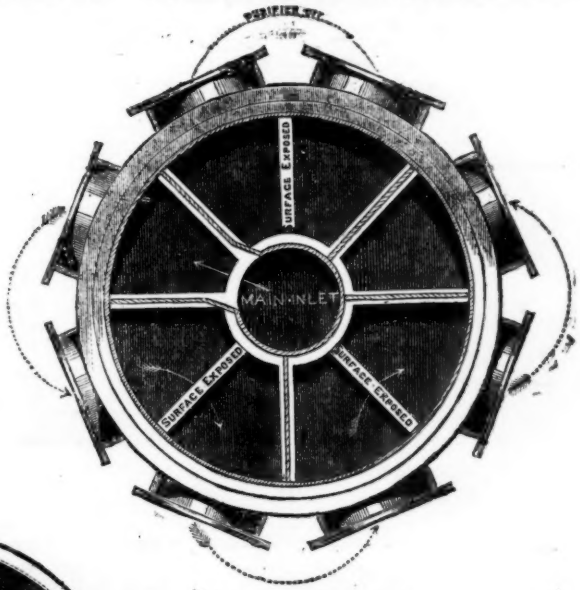
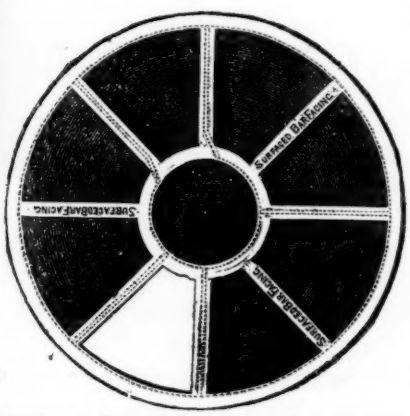
C. & W. WALKERS' PATENT CENTRE-VALVES.



Elevation of the Centre-Valve for four Purifiers. The safety cover is shown broken, to enable the Valve itself, which is inside, to be seen.



Plan of the Body, showing the Valve lying in it, with three of the facings, which were formerly exposed to settlements of dirt, carbon, naphthaline, &c., but which are now always covered by the surfaced bar-facings of the Valve. (See below.)



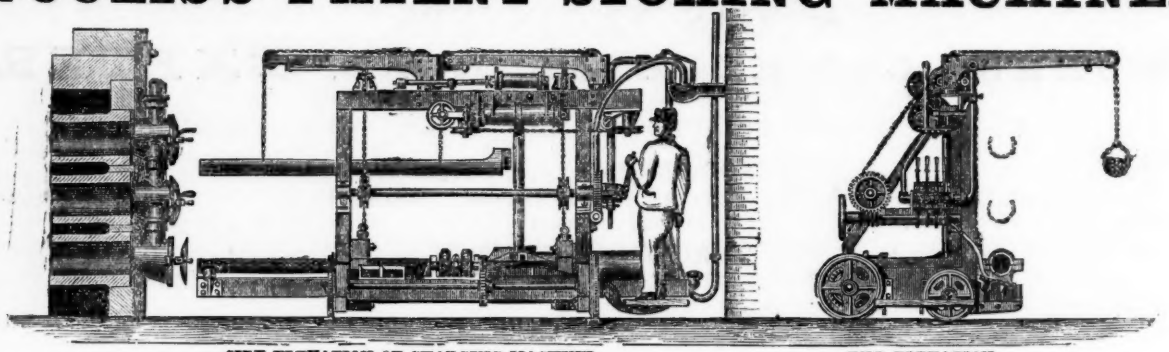
Plan of the Valve, or upper portion, showing the surfaced bar-facings referred to above.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A very considerable improvement and saving is effected in the cost of the connecting-pipes.

FOUR-WAY CENTRE-VALVES FORMING INLET, OUTLET, AND BYE-PASS.

MIDLAND IRON-WORKS, DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

FOULIS'S PATENT STOKING MACHINE.



SIDE ELEVATION OF CHARGING MACHINE. END ELEVATION.

(*The Drawing Machine will be Illustrated in next week's Advertisement.*)

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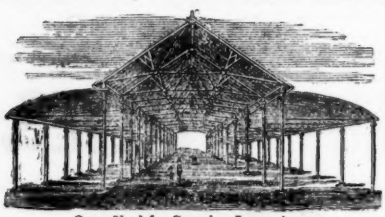

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EITHER WITH

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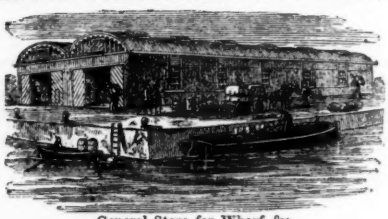

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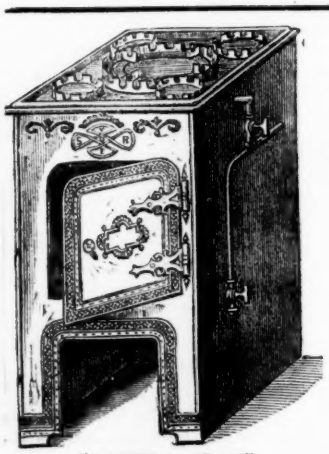
The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

JOHN WILLIAM O'NEILL, SAMUEL H. JOHNSON, } Joint Managing Directors.



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18 in. wide, 36 in. high.
Hot Plate, 24 in. by 21 in. Price £5.

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FOR CULINARY AND DOMESTIC USE.

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WITH

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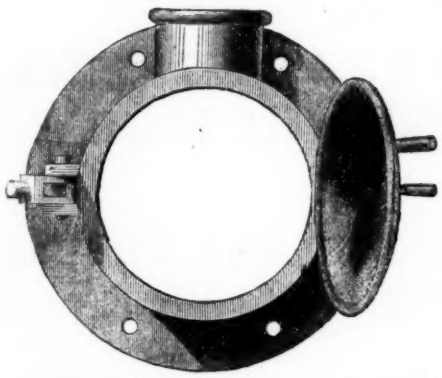

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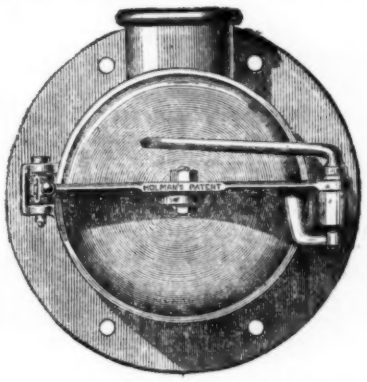


Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested (rigid cast iron is now successfully employed), nearly 15,000 being in use at various Gas-Works in London and the Provinces, among which may be mentioned:—

The Gaslight Co., Beckton (where, by the end of 1875, nearly 4000 will be in use).
" Gaslight Co., Bow Common.
" Gaslight Co., Silvertown.
" Gaslight Co., Lupus Street.
" London Gaslight Co.
" Independent do.
" Phœnix do.
" South Metropolitan Gaslight Co.
" Commercial do.
" Imperial do.
" West Ham Gas Co.
" Gas-Works, Barnet.

The Gas-Works, Royal Arsenal, [Woolwich.
" do. Lower Sydenham.
" do. Brentford.
" Consumers Gas Co., Woolwich.
" Alliance and Dublin Gas-Works.
" Edinburgh do.
" Manchester Corporation do.
" Salford do. do.
" Rochdale do. do.
" Liverpool Gas-Works.
" Birmingham do.
" Birkenhead do.
" Nottingham do.

The Newcastle-on-Tyne Gas-Works.
" Lurgan do.
" Carmarthen Gas-Works.
" Merthyr Tydfil do.
" Windsor do.
" Leeds do.
" St. Albans do.
" Over Darwen do.
" Rotherham do.
" Aylesbury do.
" Bournemouth do.
" Ystrad do.
" Cardiff do.
" Rochester do.

The Keighley Gas-Works.
" Aberdare do.
" Ballymena do.
" Richmond do.
" Stalybridge do.
" Longton do.
" Exeter do.
" Ross do.
" Falmouth do.
" Barrow-in-Furness do.
" Belfast do.
" Wakefield do.
And other Provincial and Foreign Gas-Works.

IMPORTANT TESTIMONIAL.

The Gaslight and Coke Company (Commonly called the Chartered Gas Company), Beckton, North Woolwich, July 2, 1874.

MESSRS. TANGYE BROTHERS AND HOLMAN.

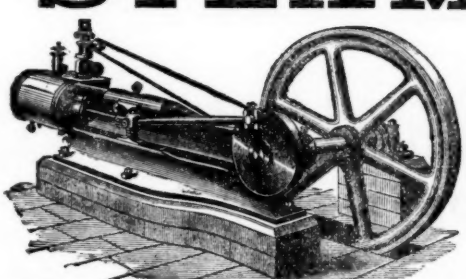
Gentlemen,—In answer to your inquiry respecting the Self-Sealing Lids, I beg to say that they continue to work well, and I have every reason to be satisfied with them.

I should be very sorry to return to the old system of Luting, and our stokers here freely acknowledge the benefit to them of the new system.

I am, yours truly,
(Signed) G. C. TREWBY.

TANGYE'S HORIZONTAL HIGH-PRESSURE EXPANSIVE

STEAM-ENGINES.



OVER 1300 SOLD SINCE THEIR INTRODUCTION IN DECEMBER, 1869.

In designing this Engine the utmost regard has been paid to simplicity of arrangement, strength of construction, and economy in cost. The working parts are considerably reduced in number, as compared with Horizontal Engines generally, rendering it far more durable and compact, the bed-plate, front cylinder cover, guides, and plummer-block for crank-shaft bearing being all cast in one piece, which in design and proportions is admitted by competent engineers to be perfect, and to afford a strength and rigidity that cannot possibly be attained in the best fitted engines of the ordinary horizontal type. The extraordinary stiffness of this Engine will permit of its being driven at a much greater maximum speed than engines generally, and with far less wear and tear. The cylinder with its valve-chest is bolted to the end of the bed. The cross-head slippers and connecting-rod ends are made adjustable, so that any wear can be readily taken up. The fly-wheel, cylinder-end, connecting-rod, and crank-plate, are all bright. All the parts are made to Whitworth's Gauges, and the material and workmanship are of the highest class throughout.

The Governor is of a very special description, and combines in the small space usually occupied by the ordinary steam stop-valve, a governor, throttle-valve, and stop-valve complete. It is exceedingly sensitive, simple, and compact.

These Engines are adopted in Gas-Works at Greenwich (Phœnix Gas Co.), Haggerston (Independent Gas Co.), Nine Elms (London Gas Co.), Falmouth, Harrow, Jersey, Plymouth, Richmond, Rochdale, Santiago (Chili), &c.

NUMBER NOMINAL HORSE POWER	B 2	C 3	D 4	E 6	G 8	H 10	J 14	K 18	M 25
Price of Engine, with Governor	£32	£38 15 0	£46	£70 0 0	£90	£115 0 0	£145	£185	£200
Feed-Pump, extra	3	3 15 0	4	5 10 0	6	7 10 0	8	10	15
Engine and Vertical Boiler on Base-Plate	75	95 0 0	110	150 0 0	180	225 0 0	280	—	—
Engine and Cornish Boiler, with Fittings	—	—	—	—	—	—	—	—	—
Variable Expansion Gear, extra	—	—	10	12 0 0	13	14 0 0	15	16	18

London 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

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5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

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AND REGULATORS FOR AVERAGE METER INDICATION.

METERS FOR MEASURING WATER.

CONTENTS.

	Page
Circular to Gas Companies:—	
The Evidence of Messrs. Reilly and Pattison on the Regulations Bill	177
The Regulations Bill	177
The Bill of the Commercial Company	177
Dr. Whitmore on the Average Meter System	178
The Appropriation of Gas Profits at Sowerby Bridge	178
The Address of Dr. Phelps	178
Water and Sanitary Notes:—	
Withdrawal of the Rivers Pollution Bill	178
The Earl of Camperdown on the Rates of the Water Companies	178
Water Affairs in Liverpool	178
Communicated Article:—	
On the Manufacture of Gas from Carburetted Peat	178
Correspondence:—	
Meters to Public Lamps	179
Parliamentary Intelligence:—	
Progress of Bills in House of Lords	179
Progress of Bills in House of Commons	179
House of Lords Committee—	
Birmingham (Corporation) Gas Bill	180
Birmingham (Corporation) Water Bill	184
Legal Intelligence:—	
Westminster Police Court—Charge of Stealing Gas	187
Miscellaneous News:—	
St. Marylebone Public Lighting	187
Meeting of the Cambridge University and Town Gaslight Company	188
Lambeth Water-Works Company	189
North British Association of Gas Managers	189
Iron and Coal Trades of Sheffield, South Yorkshire, and North Derbyshire	193
Iron and Coal Trades of South Staffordshire and East Worcestershire	193
Iron and Coal Trades of Lancashire	193
Coal and General Trade of the North	193
Trade Notes from Scotland	193
Reductions in the Price of Gas	194
Export of Coal	194
Pollution of the Thames	194
Hanley Gas Supply	194
Suffocation by Gas	194
The Gas-Fitter Sold	194
Hull Gas Supply	194
Register of New Patents:—	
Applications for Letters Patent	194
Grants of Provisional Protection	194
Notices to Proceed	194

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 3, 1875.

Circular to Gas Companies.

It has proved a great misfortune for the metropolitan gas companies that the revision clauses of the Acts of 1868-9 have only been called into operation on their behalf. The fact that a revision of price might equally have been applied for in the interest of gas consumers, seems to have been quite overlooked in the recent inquiry, and these clauses are always represented as having only a one-sided operation. We cannot blame the course the select committee took in their examination of Mr. F. S. Reilly; but it is certain, that if a wider latitude had been permitted, the representatives of the companies might have made the double action of these clauses clear to the committee, who appear to have been left with the impression on their minds that a revision could only operate in favour of the companies. Mr. Reilly, who has, we say, unfortunately, only been engaged on inquiries leading to an increase of price, was never asked his opinion as to the probable results of a revision applied for with a view to an opposite result. Such an opinion would have been valuable, in the possibility that in the next or another session of Parliament, a general Act may be passed which will include revision clauses. We do not, however, believe that any application on the part of local authorities will ever be necessary. It is so much to the interest of the companies to keep the price of gas as low as possible, that any proceedings to compel a reduction would, in these days, be unnecessary.

Turning to Mr. Reilly's evidence for some information as to what such an experienced authority considers it advisable to provide for in future legislation, we find that the first suggestion is a sort of consolidation of offices. The witness thinks that the Acts of 1868-9 provided for too many officials. There were, first of all, three referees; then a chief gas examiner, and also an auditor, as permanent officials; and, lastly, there are the three Revising Commissioners, to be appointed as their services may be required. Mr. Reilly seems to think that three competent and impartial persons might discharge all these functions, and so save money and "friction," while securing a surer protection for the interests of the public. The arrangement suggested by Mr. Reilly looks very like that proposed by Mr. Beal and his party, who want to see the gas undertakings managed by three commissioners. There is a good deal to be said in favour of this plan, and much may be brought forward against it. The difficulty, in any case, would be to find the proper parties to be entrusted with the appointments. A system of continuous revision, such as was suggested by the witness, must necessarily involve a continuous superintendence of the operations and transactions of the companies; and, therefore, the commissioners (or whatever they may be called) must be men skilled in the conduct of such affairs. Then, again, a "body continually intervening "between the consumers and companies, and adjusting matters "day by day," would be constantly occupied, and would require to be paid accordingly. A thousand a year would probably not be considered too liberal remuneration for a gentleman fitted to fill one of these appointments. On the score of cheapness, then, Mr. Reilly's plan seems to us to offer no advantage. Still, we may grant that a properly qualified commission might render essential service to the companies, and, at the same time, attend to the interests of the consumers.

Mr. Reilly's ideas respecting the mode of raising capital are those commonly entertained to-day—viz., that it should be in greater part by way of loan, at low interest. We alluded last week to a proposition, which may possibly be brought before Parliament, that, after a time, the whole of the new capital required by the metropolitan gas companies, should be raised by loans. The proposal, however, is by no means a fair one to the shareholders, who took their shares with the Companies Clauses Act before them, which requires that all new capital in a company be offered first to existing holders. It involves, in fact, a breach of faith, a confiscation of contingent profits, which the Legislature has obviously intended that a shareholder should enjoy. For this reason, so long as companies exist, we shall continue to object to large issues of loan capital.

We must confess to some astonishment at the suggestion of Mr. Reilly that the companies might go to the Metropolitan Board of Works for loans. It may be taken as certain that the Government will never allow the Board of Works to become general usurers. The Board have now the power to lend money to other metropolitan local authorities, but such an interference with commercial principles as would be involved if the Board were allowed to lend to gas companies, we are certain will never be permitted.

Mr. Pattison's evidence may be briefly dismissed. He seems to entertain some curious notions respecting the functions of a judge, which, as a Revising Commissioner, he may be considered to have been. As such, he was entitled to call for and compel any evidence which he considered necessary, with a view to its being taken in open court, in the presence of the companies and their representatives. If he believed it advisable to know what was the "leakage" of the Paris Gas Company, he might have sent for an officer of the company, whose attendance, we are certain, the directors of the Paris Company would have granted. As it is, who knows what information Mr. Pattison received, and who has had the opportunity of explaining the very different conditions in Paris and London? As to the price of coals, the companies, when before the Revising Commissioners, produced their contracts, and called eminent coal merchants. Mr. Pattison seems to have believed that these were not the "best informed" men in the coal market, so he went and made independent inquiry among such as he considered were. This was a very improper proceeding. He should have called those whom he considered the "best informed "men in the market" into court, and then we should have been able to judge of the value of the information they afforded. As it is, we know nothing whatever about the witnesses; and if we believed that their evidence really influenced the decision of the commissioners, we should strongly protest. Mr. Pattison had, however, two straightforward colleagues, who, probably, were not influenced by evidence obtained in this irregular way.

We have nothing this week to report as to the Regulations Bill. It is, of course, kept on the paper, and if the session be prolonged into September, an opportunity of getting it through committee may present itself. Further than that, the Bill is not likely to go this session. The House of Lords will not see it this year. We may, however, once again counsel vigilance on the part of the opponents. If the Bill should, by any chance, get into committee, it would be well that the sense of as full a House as can be obtained, should be taken on the several amendments proposed. The knowledge so acquired would be useful in shaping a measure for next year. It may be, however, that the Bill is only kept on the paper to give Sir James Hogg the opportunity of making a short speech on moving the discharge of the order.

The Bill of the Commercial Company has passed the third reading in the House of Lords, with, we believe, only a few verbal

amendments by Lord Redesdale, who made no objections to the capital clauses. His lordship has thus established a new precedent, which we hope will not be extensively followed. There are, probably, among the shareholders of the Commercial Company some who do not regard this Bill with entire satisfaction, and its operation will be strictly scrutinized. But there will be little time for the experiment. Whatever may be the nature of the general legislation next year, the Commercial must share in it; and our belief is that if the metropolitan companies remain true to themselves and to each other, a very different measure to this may be obtained. It rests, to a great extent, with the companies to decide their own fate, and time is now given for consultations and deliberations, which we sincerely hope will lead to a common agreement.

We are somewhat sorry to see that Dr. Whitmore has reported against the introduction of the average meter system into the parish of Marylebone. The report, which will be found in another column, gives what we must admit to be very good reasons for the conclusions arrived at. A systematic examination of regulators we have always advocated, and if this be properly carried out, little more can be desired to give satisfaction to the consumers. That little, however, we consider to be supplied by the use of a meter.

We advocate the average system because it can be set in operation at little expense, and for the reason that it has been found to give satisfaction. There is, however, much to be said in favour of the suggestion of a correspondent this week; but our correspondent has not, perhaps, considered all that the adoption of his plan would involve. One connexion with a main for 12 lamps would necessitate a service-pipe of, say, 1½ inch diameter, 720 yards long, with 12 T-pieces. This would be costly, and there would, besides, be the risk that a deposit of naphthaline would extinguish the whole 12 lamps. Taking all things into consideration, we are inclined to think the average system preferable.

The Sowerby Bridge Local Board have their own ideas about the application of gas profits. It seems to be a moot question whether their gas-works are or are not in an efficient state, and whether it is not necessary to spend a considerable sum on their improvement. At the same time there is a county bridge which it is thought advisable to widen, and the county will not pay the expense of the alteration. The Local Board have, therefore, decided to do it at their own cost, and pay for it out of the accumulated gas profits. This will, of course, be quoted as an instance, showing the value of gas-works to local authorities, and how they contribute to public improvements. We recommend the gas consumers in the district to look into the matter. We have a very strong suspicion that the gas is unnecessarily dear at Sowerby Bridge.

The speeches of the Rev. Dr. Phelps, at the meetings of the Cambridge University and Town Gas Company, are always of great interest, and, considering the position of the speaker, they have great importance. The learned Doctor is one of the most powerful and influential defenders of the rights of gas companies, and an address such as we print in another column, freely circulated among members of both Houses of Parliament, is calculated to have much more effect than all the speeches of the legal advocates before committees. We hope, then, for a wide circulation of this address, and the Cambridge Company well deserve the thanks of the metropolitan companies for their liberal support. We need not here repeat the arguments employed by Dr. Phelps, which have been used over and over again in these columns.

Water and Sanitary Notes.

Among the "innocents" sacrificed is the Pollution of Rivers Bill, which had passed the Lords, but become hopelessly blocked in the Commons. The loss of the Bill is not much to be regretted. It was a very innocent measure, capable of effecting some little good, and powerless to do harm; it might, therefore, have been thought safe to pass in the present session. The measure we may expect next year will, no doubt, be of a more comprehensive character, such as the original Bill of the Government, probably made more stringent. The country is not yet ripe for any sensational legislation on this matter, and we are a little sorry that the Government did not proceed with the modest measure they have abandoned this session.

The Earl of Camperdown, not content with attacking the metropolitan water companies in the House of Lords, has taken to writing letters to the newspapers. The noble lord appears to be now convinced that the companies have a legal right to raise the charge for water in case of an increased assessment. As to this there can be no doubt, nor can there be a question that the words "annual value" in the special Acts mean "gross annual "value," and not rateable value. We have said before, however, that the companies have never availed themselves of their legal rights to the full extent—nor are they likely to next year—although some advance in the rates must naturally be looked for in 1877. It is, we may say, impossible for any Government to step in and prevent the advance. The Duke of Richmond saw this clearly enough, and would not pledge the present Government to any action in the matter. Lord Camperdown, therefore, has to look for relief in another direction, and he sees it in the confiscation of the companies. "It may be hoped," he says, "that before long the metropolis "will have adopted some *tolerable* form of government. In the "interval"—*that is, while the form of government is intolerable*— "why should not the Metropolitan Board of Works," he asks, "be entrusted with the water supply of the metropolis?" He goes on to suggest that the companies should be bought up early next year, the compensation for the undertakings being fixed upon the maximum charges legal under the Metropolis Valuation Act of 1871. We scarcely understand this proposal, which introduces a new principle of valuation never to be accepted by the companies.

Water continues the question of the day in the Town Council of Liverpool, and the council seem as far as ever from arriving at a decision as to the future source of supply. If we rightly understand the popular feeling in Liverpool, there seems to be a growing desire to see a fuller development of the present sources at a comparatively small cost. This may be only putting off the evil day; but it may be taken as certain that a town's meeting under the Borough Funds Act would never, until the urgent necessity for it could be shown, sanction the expenditure of two millions on one of the grand schemes before the council. In the meantime, while the greatest economy is practised, with, we are happy to see, most beneficial sanitary results, the demand for water for trade goes on increasing at an extraordinary rate. The Water Committee report that the meter returns for the past six months show a steady increase on the demand of two millions of gallons per week, and this while trade has been in a depressed state. The stop-tapping is now nearly completed, and the constant service will soon be restored all over the borough. The late rainfall has added largely to the quantity of water in store, an increase of 299 millions of gallons (that is nearly three weeks supply) being reported between the 20th and 23rd of last month.

Communicated Article.

ON THE MANUFACTURE OF GAS FROM CARBURETTED PEAT.

(Martin's Process.)

(from our Paris correspondent.)

(*Concluded from page* 140.)

Having considered the difficulties to be encountered in the manufacture of peat gas, let us examine the production and preparation of the raw material. Let us take, as an example, the turf-pits of Normandy, where peat, worked under the best conditions, costs on the spot, without profit, 9 francs per ton. To carburet this crude peat, either of the following methods may be selected:—

1. Carburation at the pit.
2. Carburation at the place of destination.

If the first method be adopted, it will be necessary to fit up at every turf-pit a vast establishment, comprising extensive sheds, in order that the supplies of carburetted peat may be protected from the inclemency of the weather. The storeage of peat is of so much more importance, considering that its extraction takes place only during the four months of spring, and that gas-works consume three-fourths of their carbonizing material during the six months of winter. To the cost of the hydrocarburets must also be added that of their carriage to the turf-pit; account must likewise be taken of the considerable loss resulting from storeage. Under such conditions, the price of carburetted peat may be estimated at from 28 to 30 francs per ton at the pit.

If the second method be chosen, the carburation being effected at the works, the net price will be quite as high, as the division of labour and apparatus would augment rather than diminish it; and, in this case, it would be necessary to take every precaution that the peat, which would be despatched from the turf-pit with 10 per cent. of water in it, should not absorb as much, and perhaps more, in the course of transit. It would have to be stored in sheds, and conveyed in carts, waggons, or covered boats to the store in the works for which it was destined; for it must not be forgotten that peat containing more than 10 per cent. of water resists carburation, and yields very inferior results on distillation; the purification of the gas becomes more costly, in consequence of the increased amount of carbonic acid gas produced by the decomposition of the water; and, finally, the expenditure of combustible material for heating the retorts is augmented.

Moreover, the carburation of peat, on a large scale, presents serious difficulties in practice. For instance, in a peat-bog the successive layers are always of different natures; and it is often found that one of the layers contains peat more or less charged with alumina or with calcareous deposits, though differing in no respect, as far as regards appearance, from other peat obtained from the same layer. It may happen, therefore, that during the process of steeping

in the carburetting baths, one piece of peat will be saturated in 15 minutes, if it contain but little or no impurity, while another will not be penetrated even in 12 hours. Hence result considerable differences in quality, which it is impossible to foresee, inasmuch as the outward appearance of the peat is the same.

It is, of course, impossible to establish generally the relative difference in the pecuniary value of gas manufactured from peat and from coal. We can only base our estimates upon certain results obtained in that part of France where peat is produced—viz., in Normandy—and, consequently, arrived at under the most advantageous conditions for the employment of the new process in this country:—

	Fr. c.		*s. d.*
Net price per ton of crude peat at the pit, without profit . .	9 0	say	7 6
Bath composed of—			
80 per cent. of naphthaline, at 5fr. per 100 kilogrammes . .	4 0	„	3 4
20 per cent. of heavy petroleum oil, at 25fr. per 100 kilos. . .	5 0	„	4 2
Total, exclusive of carriage	9 0	„	7 6
Add 4 per cent. loss by evaporation during steeping and the preparation of bath.	0 36	„	0 3
Total	9 36	„	7 9

The following are the details of the cost of peat carburetted in the preceding bath at the turf-pit:—

	Fr. c.		*s. d.*
One ton of crude peat.	9 00	say	7 6
Carburation: 20 per cent. of bath, at 9fr. 36c. per 100 kilogrammes—viz., 200 kilogrammes.	18 72	„	15 0
Labour for steeping, preparing and keeping up bath, and stacking peat carburetted	5 00	„	4 0
Heating bath, and replenishing steeping material	1 00	„	0 10
Total for 1200 kilogrammes	33 72	„	27 4

Being at the rate of 28fr. 10c. (22s. 6d.) per ton in the store at the turf-pit, exclusive of profit.

Let us admit, for the present, that the manufacture of gas takes place in the town nearest the turf-pit; in this case the net price of the carburetted peat sold at the works will be 37fr. 70c. (30s.) per ton, including the expenses of transport, loading, and unloading. The net price of coal at the same works is 25 francs per ton.

PEAT GAS.—*Expenditure.*

	Fr. c.		£ *s. d.*
One ton of peat carburetted	37 70	say	1 10 0
Labour for the distillation of 3360 kilogrammes of peat, viz.—			
One day and one night stoker, at 4fr. each . . .	8fr.		
One day and one night labourer, at 3fr. each . .	6 „		
Total	14fr.		
Or per ton.	4 16	„	0 3 6
Heating: 526 kilogrammes of coke per ton of peat distilled, at 40fr. per ton	21 04	„	0 17 0
Purifying 350 cubic mètres (12,360 cubic feet) of gas by lime; 350 kilogrammes of lime, at 2fr. 50c. per 100 kilogrammes	8 75	„	0 7 0
Total expenses per ton of peat	71 65	„	2 17 6

Receipts.

	Fr. c.		£ *s. d.*
350 cubic mètres of gas, less 20 per cent. of carbonic acid extracted in purification = 280 cubic mètres, at 30c. per cubic mètre	84 0	say	3 7 6
180 kilogrammes of coke and breeze, at 50fr. per ton . .	9 0	„	0 7 6
80 kilogrammes of cinders and dust, at 10fr. per ton . .	0 80	„	0 0 8
50 kilogrammes of tar, at 4fr. 50c. per 100 kilogrammes .	2 25	„	0 1 10
Total receipts per ton of peat.	96 05	„	3 17 6
Deduct expenses as above.	71 65	„	2 17 6
Profit per ton of peat	24 40	„	1 0 0

COAL GAS.—*Expenditure.*

	Fr. c.		£ *s. d.*
One ton of coal.	25 0	say	1 0 0
Labour for the distillation of 4200 kilogrammes of coal, viz.—			
Two stokers, at 4fr. each	8fr.		
One labourer, at 2fr.	2 „		
Total	10fr.		
Or per ton.	2 38	„	0 2 0
Heating: 210 kilogrammes of coke per ton, at 40fr. per ton	8 40	„	0 7 0
Purification by oxide of iron, per ton	0 40	„	0 0 4
Total expenses per ton of coal.	36 18	„	1 9 4

Receipts.

	Fr. c.		£ *s. d.*
280 cubic mètres of gas, less 3 per cent. of carbonic acid extracted in purification = 271·6 cubic mètres, at 30c. per cubic mètre	81 48	say	3 5 6
19 hectolitres of coke, at 1fr. 60c. per hectolitre . . .	30 40	„	1 4 6
50 kilogrammes of tar, at 4fr. 50c. per 100 kilogrammes .	2 25	„	0 1 10
Total receipts per ton of coal.	114 13	„	4 11 10
Deduct expenses as above.	36 18	„	1 9 4
Profit per ton of coal	77 95	„	3 2 6

We do not wish to dwell here upon the difficulties in the way of procuring naphthaline in sufficient quantity to supply a gas-work of any magnitude for a definite length of time, but it is known that a ton of coal produces only 2·5 kilogrammes of naphthaline. On the other hand, what will be the commercial value of heavy petroleum oil when its employment shall have made its way into gas-works? The foregoing calculation is sufficient to show the impossibility of bringing into operation the manufacture of peat gas in France; and as far as other countries are concerned, experience does not appear to be more satisfactory, for the Martin process is not a new invention. We notice that three patents, having the same object, were taken out in England in 1871 by Messrs. Mackenzie, Walker and Smith, and Hamilton; and in Russia, at the gas-works at Kiew and St. Petersburg, where these processes have been experimented upon, it has been found impossible to obtain advantageous results from them, and they have consequently been abandoned, notwithstanding the existence of abundance of peat and lignites in those countries.

Correspondence.

METERS TO PUBLIC LAMPS.

SIR,—I have never been satisfied with what is called the "average meter system" for street-lamps.

I think all lamps might be supplied by meter, without necessitating either special mains or a meter for each lamp, by using, say, a 5-light meter for every six, or a 10-light meter for every 12 lamps, and having only one connexion between each set of lamps and the main.

The governors would then be simply what they ought to be—a means of regulating the consumption, and not, as they are at present, and ought not to be, "instruments used in the sale of gas." W. C.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JULY 26, 1875.

The Commercial Gas Company's bill was reported, with amendments.

The Commons amendments to the Gas and Water Orders Confirmation Bill were considered, and agreed to.

CONSPIRACY AND PROTECTION OF PROPERTY BILL.

The LORD CHANCELLOR, in moving the second reading of this bill, said it dealt first with questions affecting the supply of gas and water. It provided that where a person employed by a municipal authority or a company wilfully and maliciously broke a contract of service, the probable consequence of his doing so being to deprive the public of gas or water, he should be liable, on conviction, to a penalty not exceeding £20 or to imprisonment for a period not exceeding three months, with or without hard labour. The Government held that a person thus acting not only committed a breach of contract incurring civil damages, but a criminal offence, for which he ought to be criminally responsible. Some criticism had been passed on that clause elsewhere, because it dealt only with persons in the service of a company or a municipal authority supplying gas or water, and not with all persons whomsoever, not, for example, with the company or the municipal body itself, which might be in default, or with the coal merchant, who might not fulfil his contract to supply coals for making the gas. The answer to that criticism seemed to be extremely simple. In the first place, to punish a company or a municipal body criminally was not an easy matter; it was not practicable. In the next place, they had an ample security in the case of a municipal authority or a company for the performance of its duty, because to plunge a town in darkness or deprive it of its supply of water would be fatal to the continuance in office of its office-bearers, and also to its trading prosperity. So, again, with the outside merchant contracting to supply coals. The company could easily contract with whom it pleased, and no penalty of that kind was necessary for the case of the coal merchant. The conclusive justification for the form in which the clause stood was that the servants of gas and water companies were persons in a fiduciary position. The companies must employ servants, and those servants again must be trusted; and a breach committed by them of a contract of that kind, seriously damaging the public interests, was a wholly different species of act from the breach of contract which might be committed, for example, by a man who was bound to supply coals. After explaining the bearing of some subsequent clauses, specially referring to those which dealt serious injury to life and destruction of property, &c., the noble and learned lord intimated that the Government, with a view to render the 8th clause, imposing a penalty for intimidation or annoyance by violence or otherwise, more precise and definite, would propose to amend it in committee.

Lord WINMARLEIGH differed from the Government on some points in this matter, believing that in certain cases the 5th clause of the Conspiracy Bill would provide no adequate redress for the injury done to an employer.

Lord ABERDARE expressed objection to some parts of the proposed legislation, but admitted that, on the whole, it was a great advance on previous attempts.

The bill was then read a second time.

TUESDAY, JULY 27.

On the motion of Lord ROSEBERY, returns were ordered to be laid before the House from every urban sanitary district in Scotland having more than 5000 inhabitants, similiar to those ordered for England on Tuesday, July 20.

THURSDAY, JULY 29.

The Commercial Gas Company's bill was read the third time, with the amendments, and passed.

The Conspiracy and Protection of Property Bill passed through committee.

FRIDAY, JULY 30.

The Stroud Water Bill was recommitted for Monday, Aug. 2.

HOUSE OF COMMONS.

MONDAY, JULY 26, 1875.

The Lords amendments to the Birmingham Corporation Water Bill were agreed to.

METROPOLIS GAS COMPANIES BILL.—Petitions against this bill were presented from South Shields Gas Company and Louisa Dunlop. The committee on the bill was deferred till Tuesday, July 27.

POLLUTION OF RIVERS BILL.

Mr. DISRAELI, in reply to Mr. RIPLEY, regretted to say that it was not possible to proceed with this bill during the present session, and the President of the Local Government Board would take an early opportunity of moving that the order be discharged. This was done later on in the evening.

TUESDAY, JULY 27.

METROPOLIS GAS COMPANIES BILL.—The committee on this bill was further deferred till Monday, Aug. 2.

WEDNESDAY, JULY 28.

POLLUTION OF RIVERS BILL.

Mr. TENNANT asked the President of the Local Government Board whether, having regard to the pressing necessity of some measure for preventing the pol-

lution of rivers, Her Majesty's Government would give an assurance that they would early in the next session introduce a bill for that object, and would in the meantime make such inquiries and investigations as would enable them to deal effectively with the whole question.

Mr. SCLATER-BOOTH.—It is rather early days for the Government to pledge themselves as to what specific measures may form part of their programme for next session, but my honourable friend may rest assured that the pollution of rivers is a subject of so much importance and of such growing interest that it cannot fail to occupy their serious attention during the recess. For myself, I can readily promise him that no pains will be wanting on my part to collect any further information which may be required for dealing with the subject effectively.

HOUSE OF LORDS COMMITTEE.

WEDNESDAY, JUNE 23.

(*Before Lord* PENRHYN, *Chairman; the Duke of* GRAFTON, *Lord* CASTLEMAINE, *Lord* RAGLAN, *and Earl* GREVILLE.)

BIRMINGHAM (CORPORATION) GAS BILL.

Sir E. BECKETT, Q.C., Mr. MICHAEL, and Mr. DUGDALE appeared for the promoters; Mr. ASPINALL, Q.C., Mr. POPE, Q.C., and Mr. LITTLER, Q.C., for the London and North-Western and Great Western Railway Companies; the, Hon. GRANVILLE SOMERSET, Q.C., and Mr. PEMBROKE STEPHENS for the West Bromwich Improvement Commissioners; Mr. VENABLES, Q.C., for the Smethwick Local Board; Serjeant SARGOOD for the Oldbury Local Board; and Mr. CLERK, Q.C., and Mr. O'HARA for the Tipton Local Board.

Petitions against the bill had been also presented from the Birmingham and Staffordshire and the Birmingham Gaslight and Coke Companies, and the Local Boards of the Manors of Aston and Handsworth.

Sir E. BECKETT, in opening the case of the promoters, said the questions to be submitted to their lordships, though very important, as they involved the interests of a large population, were not in themselves difficult, and involved no complicated considerations. A good many petitions had been presented formally against the preamble of the bill, but, in substance, they were rather against clauses. The population of Birmingham at the present time had reached 360,000, and was increasing daily. The gas supply of the town was in the hands of two companies, the Birmingham Gas Company and the Birmingham and Staffordshire Gas Company, which for brevity he would call the Staffordshire Company. The latter supplied gas not only inside the borough of Birmingham, but to a large district outside in addition. The capital of the Birmingham Company was £300,000, with a reserve-fund of £30,000, and borrowing power to the extent of £90,000, the whole of which had been exhausted; £100,000 of the capital of the company had a maximum dividend of 9 per cent., and £200,000 a maximum dividend of 7½ per cent. The capital of the Staffordshire Company was £320,000 at 10 per cent., and £350,000 at 7½ per cent., making a total maximum dividend of £58,500. That company had also a borrowing power of about £100,000, of which they had not exercised more than about £23,000; and they were empowered to have a reserve-fund. The events which led to the present proposed transfer were these—In the year 1869 the Birmingham Company had a bill before Parliament for increasing their works and to extend their area, but as they were unable to agree with the Staffordshire Company on the matter, the bill was dropped in the House of Commons, and nothing more was heard of it. Then their secretary absconded with no less than £27,000, which absorbed nearly the whole of their reserve-fund. Presently afterwards came the rise in the price of coal and labour. The result was that in 1872 their dividends fell from 9 per cent. and 7½ per cent. to 5 per cent. That, however, was only temporary, and their dividends had improved again. At the time the dividends fell there was a great commotion in the company, and a new board of directors was appointed. That new board came to the conclusion that it was necessary to increase their works and capital. The maximum consumption of gas from the Birmingham Company had more than doubled between 1861 and 1871, having increased more rapidly than the population had done; but in the case of the other company, the increase had not been in anything like the same proportion. The Birmingham Company accordingly gave notice for a bill in the year 1874, which included the provision of a new site of works, and an increase of capital to the extent of £300,000—in fact, to double their capital. Somehow it came to pass that when great companies came for increased capital, they generally found it necessary to about double their existing capital; and it was reckoned by engineers that the capital they got on that footing would, in the case of these large towns, last 15 or 20 years. The promoters of the present bill had allowed the Birmingham Company to pass a bill for increased capital through the House of Commons, so that it might be proceeded with if any accident befell the corporation bill, which he hoped would not be the case. With regard to the Staffordshire Company, the total quantity of gas supplied outside the borough bore no proportion at all to the population, as it was only about a fifth of their whole supply. The Staffordshire Company had also a bill for increased capital. If the corporation bill did not pass, the two gas companies would be asking Parliament between them for additional capital of no less than £770,000 to meet the prospective increase of the gas supply for 15 years to come, and they would ask, in addition, for the usual proportion of borrowing power—namely, one-fourth, which would amount to £192,000. The pecuniary advantage to the town by the proposed transfer would arise from the circumstance that the new capital, if raised by the companies, would be liable to dividends of 7 per cent., whereas large corporations in a good financial position could borrow their money at 4 per cent., and the difference between these rates would amount to £22,000 a year. In addition to that, there would be the prospect of a saving on any further increase of capital which might be necessary another 15 years hence. The Birmingham Corporation had been wiser than the Metropolitan Board, and instead of worrying the gas companies, they had gone to work in a rational way, and had asked the companies to sell their works. The terms rested upon their dividend-paying powers, and, the accounts of the two companies having been investigated, and all necessary inquiries made, the corporation had come to the conclusion that it would be to the advantage of the town of Birmingham if they were to purchase the works. The Birmingham Company were under more stress for new works than the Staffordshire Company, and accordingly, in a certain sense, the Birmingham Company went for a less sum than the Staffordshire Company. The Birmingham Company's capital of £300,000 would be sold for £450,000. The Staffordshire Company preferred to be dealt with as annuitants, and they were to receive annuities equivalent to their maximum dividends. That was by no means an unfair bargain, for it would be evident what the shareholders would lose and what they would gain. They gained something, because no doubt a fixed dividend, on the security of the corporation, would sell in the market at something more than the company's maximum dividend would sell at, while, on the other hand, they would lose the prospective dividend on new shares. There was some opposition to the bill in the House of Commons, from Birmingham gas consumers, but he was glad to find that that was not now continued. The present opposition was of a peculiar kind, being offered on the one hand by some of the local boards in the outside district, and on the other from a couple of railway companies. The local boards of some of the outside places objected to the provision introduced into the bill in the first place at their own request, and afterwards modified at their request, combined with the House of Commons committee. The provision to which he alluded—the 36th clause of the bill—now gave power to any of the local boards to purchase the supply and pipes of their district at a rateable proportion of the price paid by the corporation to the Staffordshire Company, deducting one-fifth in respect of the West Bromwich works, which would remain in the hands of the corporation. The House of Commons committee, alluding to this provision, stated that the corporation appeared to have dealt very liberally with the local boards. The opposing boards objected to the corporation being free from any limitation of profit, contending that there would be a great inducement to the corporation to keep up the price of gas, in order to earn a large profit for the benefit of the borough rate. With reference to this, he might observe that the tendency of the Legislature had been to allow the acquirement of gas companies by public bodies, and he believed there had not been a single instance of a corporation being limited as to the rate of profit they were to earn, and for the reason that the corporation represented the ratepayers, and the ratepayers being practically identical with the buyers of gas, always seemed more anxious for a diminution of their gas bills than to seek any prospective advantage by keeping up the price. Petitions against the bill had been presented by the Great Western and the London and North-Western Railways. These two companies were ratepayers within the borough of Birmingham, and they objected to the preamble, as they desired a reduction in the mode of rating, provided any obligation was thrown upon them should there be a loss arising out of the undertaking. They set forth that the railway passed through Birmingham, and that their stations, works, and so on were lighted at their own expense; and, if there should be a loss on the gas undertaking, they would have their rates largely increased. But there was this difference between their case and that of the ordinary ratepayers—that, under the Local Government Act, railways, gardens, and agricultural land were rated at only one-fourth of the usual amount to the local burdens. No one else besides the railway companies had objected to the rates, and the liability to have them increased, and it was not the practice in their lordships House to hear a particular ratepayer who objected to a public measure of the character of the present bill. If all those who were so interested were to combine together, the committee might consent to entertain their objection; but, in this case, there were only two ratepayers who came forward to oppose the bill on these grounds. In the House of Commons it was said that these people, being contributors towards the rates for other purposes, would get the benefit of any profit made on the gas undertakings. So that, while they did not object to reaping an advantage from the transfer of the works, they were very anxious to escape liability to risk of loss, if there were any risk, which, he ventured to say, was extremely problematical. It was also a strange circumstance that, on the one hand, the outside local boards should be afraid the corporation would, if the transfer took place, make too much profit, while, on the other, the railway companies should be afraid of their incurring a loss. He thought that, although the argument on the merits of such petitions must be very nearly the same as the argument on *locus standi*, it would be well to begin with deciding whether the companies were entitled to be heard.

Mr. ASPINALL said that the two railway companies for whom he appeared had about five miles of railway passing through the town of Birmingham, so that the question of rates was no small one to them. Each of the companies paid £5000 a year towards the local rates. They claimed that they were entitled to exemption from three-fourths of the rates that might be imposed upon them in respect of the provisions of the present bill. Under the Local Government Act of 1858, it was provided that railways should be assessed for property within the borough boundaries at only one-fourth of their rateable value, and this provision they demanded should be applied in the case of rates raised under this bill. By the agreement confirmed by the Local Government Act, the charges were contingently to be made on the borough fund or rate. It was clear, looking to the various sections of the Act, that the risk or contingent charges were intended to be so imposed. Under the local Act, specially applying to Birmingham, providing for gas, sewage, and other matters, there was this identical exemption with reference to the rate out of which the expenses of that Act were to be paid. In 1872, when the bill applying to sewerage was applied for, it was endeavoured to have the expenses paid out of the borough rate instead of out of the borough improvement rate. The railway companies objected to that, as it would prevent them from obtaining the exemption to which they were entitled. Last year this question was before their lordships House on a bill brought in by the Corporation of Neath for the purchase of the undertaking of the water company. In this case the Great Western Railway petitioned against it, on the ground that the charge ought not to be placed on the borough rate, by which they would be deprived of their exemption. That petition was successful, and the committee granted the very exemption which the same company were now asking might be continued at Birmingham. They had a perfect right to protest against the bill on the same grounds, unless there was an express provision inserted in accordance with the terms of the Local Government Act.

Sir E. BECKETT said in the Neath case there was no similar clause to that in the Birmingham Act of 1871, which provided that the expenses should be defrayed out of the borough rate. The Neath case was the decision of a single committee, and could not be set against the decision of the Legislature at large. All the London railways were liable for sewer rates. He endeavoured in some cases to get them exempted, but in vain; and the tendency of the Legislature had continually been against granting this exemption. In granting a *locus standi*, committees never failed to inquire if there was a substantial grievance presented by petitioners, and if not they invariably declined to allow the prayer of the petitioner.

The committee, after a brief consultation, allowed the *locus standi* of the petitioners.

The first witness called for the promoters was the Mayor of Birmingham (Ald. Chamberlain), whose evidence, to a great extent, was a repetition of that given by him when the bill was before the House of Commons, with reference to the extent of the borough and its population, number of inhabited houses, and cost of gas for public purposes, &c.; also as regards the negotiations with the companies, and the anticipated results of the purchase of the gas undertaking. The terms were to pay the Birmingham Company a lump sum of £450,000, and to the Staffordshire £58,290 annually, being the amount of the maximum dividends. Some of the advantages of taking over the gas would be the exercise of a greater amount of economy, and the amalgamation of the piping, staff, and general management. At present there were two parallel sets of pipes in the streets. Over and above those direct advantages he calculated the annual profit of the Birmingham and Staffordshire Companies at £63,983. They would make a saving of interest of £16,000; in directors fees, £12,000; income-tax, £607; total, £67,390. The yearly profit of the Birmingham Company, including the same fees, interest, &c., they put at £28,000 per annum; profit of the concern, £95,390 per annum. This, with other items, and allowing for interest, would leave a profit of £19,340 per annum, without reference to the savings in amalgamation, or the immense profits which would be made in the future from the increase of business. He would propose to re-organize the works thoroughly. It was part of the scheme that the same circumstances attaching to the supply of gas should continue. They intended to charge the same price for gas as the companies would charge had they continued to supply the gas. The consumers formed the greater proportion of the population of Birmingham, and were largely interested in the question. If the gas was in the hands of the towns the ratepayers would have great control over the management of the gas through their representatives, and could bring great pressure to bear on the corporation to supply gas cheaply. At present they had no control, or at best it was illusory. The interest of the ratepayers would not be so greatly adverse to the consumers, as to induce them to make a high charge for the gas with the view of making a profit. The outsiders, being guaranteed by the bill, to be supplied at the same rate as those

in the town, they would be greatly benefited rather than otherwise. The four districts now opposing were a fifth of the whole population, and were a tenth of the consumers. The sum they proposed to give for the undertakings was 1½ millions. Those outside districts wished to have a distinct supply. In purchasing those works the corporation bought three things—the whole of the works and manufacturing plant, the whole of the main and distributing plant, and the whole of the goodwill. The value of the works being one-fifth of the whole sum, any of the boards wishing to buy without undertaking the works ought to pay four-fifths or the rateable proportion of the distributive plant, and the rateable proportion of the goodwill, leaving out the works. The result of taking over the gas would be, he believed, a reduction in the price of gas, in which the outside districts would participate.

Cross-examined by Mr. VENABLES: The ratepayers of Birmingham would not have a distinct interest in keeping up the price of gas, although the profits arising therefrom would go to the borough rate, and would not benefit the outside districts, which could be large consumers. The advantage would be so fractional or infinitesimal that the ratepayers would never consent to do it. If such a thing were done, then the outside districts could come to Parliament under the purchasing clause, and obtain a remedy of their grievance. Experience had proved, however, that the ratepayers in other towns where the gas was in the corporation's hands were in favour of reducing the price. The benefit arising from a low-priced gas was felt at once, and created a feeling in its favour, whereas the benefits accruing from any profits going into the borough fund were too remote to create a desire to keep up the price.

By Mr. CLERK: Witness said he could not tell what proportion of gas was made by the Staffordshire Company and sold outside the borough. The total make for 1874 was 424,467,000 feet; and the total sale was—For Wednesbury, 49,000; Darlaston, 26,000; Tipton, 49,000,000; West Bromwich, 109,000,000; Oldbury, 33,000,000; Smethwick, 66,000,000; Harborne, 14,000,000; Handsworth, 62,000,000.

Mr. CLERK: Did you ever hear of a corporation allowing the reserve-fund to be retained by the companies?

Witness: I have heard of more onerous cases.

Mr. CLERK: Have you not heard that the Corporation of Glasgow wanted to allow the reserve-fund to be retained by the companies, and Parliament would not allow them?

Witness: I wish Parliament would do the same with us. It will be necessary to enlarge the works at Birmingham, amounting to about a tenth of West Bromwich. We are paying 19 years purchase to the Birmingham Company on their maximum dividend, or 25 years purchase on the dividend they were then paying.

Mr. CLERK: We know that at that time they were suffering severe loss through the defalcations of their secretary, and were only gradually recovering themselves, and are now paying their maximum dividend, are they not?

Witness: Yes, they paid it last half year for the first time for a long time.

By the CHAIRMAN: In the case of Glasgow two companies works were purchased, and the gas was afterwards supplied to a large outside district, as we propose to do, and the profits go to the borough fund.

Mr. CLERK: The calculation of one-fifth as value of the works is the value of the works at the present time.

The CHAIRMAN: You spoke some time ago of having inquired into the cases of other corporations which had gas-works, and none of them had a limitation of maximum profit. In those cases, do they supply as large an outside district as this?

Witness: In many cases it is a large area; but I do not know the exact extent.

THURSDAY, JUNE 24.

The *Mayor of Birmingham* was recalled and cross-examined by Mr. SOMERSET. He said the present debt of the borough was about three-quarters of a million, which was chiefly raised at 4 per cent. Part, however, was raised at 3½ per cent. from the Public Works Commissioners; a portion was also raised from the public, at short notice, at 3½ per cent. There was only a very small part raised at a higher rate than 4 per cent. Four per cent. was practically the rate. The maximum price of gas was 4s., but it was not proposed to charge that. The corporation expected to realize a profit by the works.

Mr. SOMERSET: Will not all this go to the advantage of the ratepayers of Birmingham without benefiting the ratepayers in the outside districts?

Witness: Unless they contribute to the expense of the undertaking, they will not derive any benefit from the profits. It would be to our interest to conduct the business as economically and efficiently as possible with capital raised at a lower rate than in the case of a public company.

By Serjeant SARGOOD: Why do you not take over the reserve-fund of £40,000 of the Staffordshire Company when you buy the whole concern?

Witness: Because we could not get it on satisfactory terms.

Serjeant SARGOOD: But do you not think you ought to have it?

Witness: We should be very glad to have it. If I were a director of the company I should not give it up.

Serjeant SARGOOD: You have paid them the full value of their concern for ever, and you do not take over the reserve-fund?

Witness: We do not pay them the full value for ever, but the full present value.

Serjeant SARGOOD: Then it was worth your while to buy the whole of their trade and plant, and distributing apparatus, and because they insist on it you allow them to keep back this £40,000 reserve-fund?

Witness: When we arranged for the transfer, the reserve-fund was only a matter of a few thousands, and we did not expect the company would ever be able to make it up. In the course of the delay, however, that took place, the reserve-fund grew in amount till it reached its present value.

Serjeant SARGOOD: Besides this reserve-fund, is there not an item of undivided profits; do you know what that is?

Witness: No. We thought it was not of any practical value, as we did not consider the company would ever be in a position to make up their reserve-fund?

Serjeant SARGOOD: Can you tell me the total yearly sale of gas by the Staffordshire Company?

Witness: It amounted for one year to 1,462,172,000 cubic feet.

Serjeant SARGOOD: And how much of this was supplied to the outlying districts?

Witness: About 460 million; that would be about one-third of the whole quantity.

Serjeant SARGOOD: Do you know for how long a period the Staffordshire Company paid their full maximum dividend?

Witness: I do not know exactly, but I should think for 20 years.

Serjeant SARGOOD: As you are going to make gas so economically, and conduct the business so efficiently, why do you not guarantee to supply the outlying districts at the same maximum rate as the Staffordshire Company have supplied those districts?

Witness: We should be quite willing to do so, provided you would guarantee the same circumstances in the future as have existed in the past.

In re-examination, witness stated that a letter had been addressed by the town clerk to the various local boards in the district, asking them to send a deputation to attend a conference in Birmingham with regard to the gas bills to be submitted to the House of Lords committee. In response to this invitation, the chairman and clerk of the Aston Local Board attended, but the other local boards refused to take part in the conference. This correspondence had taken place in the interval between the passing of the bill by the House of Commons and its consideration by the present committee. He had endeavoured to ascertain whether the proportion of one-fifth proposed to be charged for the West Bromwich works fairly represented its value, and found that it would do so within a trifle. The capitalized value of the annuities was nearly a million and a half; and the value of the works just £300,000, being therefore, slightly over one-fifth of the purchase money.

Mr. *J. T. Collins*, chairman of the Birmingham Gas Company, said the number of cubic feet of gas generated by his company in 1856 was 342,000,000 odd; in 1861, the number was 432,000,000; in 1871, 795,000,000; in 1874, 798,000,000. The maximum consumption on any day in 1856 was 1,800,000 feet; in 1861, 4,500,000; in 1874, 4,700,000. The gas-rental had not increased in anything like the same rate; it had been as follows:—1856, £47,000; 1861, £61,000; in 1871, £82,000; and in 1874, £117,000. For some years past the company had supplied gas with an illuminating power of 15 candles. The price charged had been as low as 2s. 7d. per 1000 feet. That was in the year 1873. Then came the rise in the price of coal, and the company raised its rate to 3s. 6d. It was difficult to say whether, if the price of coal had kept up for another year, the company would have been obliged to raise their price again. They might have found 3s. 6d. sufficient. With reference to the purchase of their undertaking, he certainly did not think the company would accept the same price now as they agreed to when the town council negotiated and came to terms with them.

By Serjeant SARGOOD: He could not tell what proportion the gas consumers in Birmingham bore to the ratepayers, but he should think the ratepayers would be more numerous than the consumers. There would be scarcely a gas consumer who was not a ratepayer, but there would be a considerable number of ratepayers who were not gas consumers. The company had about 17,000 customers.

Serjeant SARGOOD: If it came to a question of whether the rate for gas should be 4s. or 3s. 6d., the consumers would wish it to be 3s. 6d.; but the ratepayers, having in view the fact that the surplus profits of the gas would be applied to the reduction of the borough rates, would wish it to be 4s., more particularly if those ratepayers were not themselves gas consumers?

Witness: Certainly.

Mr. *H. Parry*, assistant-secretary to the Staffordshire Company, examined by Sir E. BECKETT, said the consumption of gas, as supplied by his company in 1855, was 362 million feet; in 1865, it was 803 millions; in 1871, it was 1183 millions; and in 1874, it was 1462 millions. The number of their consumers in 1874 was 19,910. In 1864 the maximum rate charged was 3s. 4d.; at the present time it was 3s. 6d., which was the highest price his company had ever charged.

In cross-examination, he said the secretary of the company, Mr. Walsh, was not able to attend. He (witness) could not tell how the value of the company's retorts, which were put down at £27,000, had been arrived at. The reserve-fund in December last was £18,244. He was not aware that an application was made to the company by the Tipton Local Board for permission to examine the works and ascertain the actual value of the mains in their district, and that that permission was refused. He had heard it so stated in evidence, but he was not himself aware of the fact. The value of the company's works and distributing plant, as appearing on the books at the present time, was £639,221 13s. 9d. He had not calculated what the offices in Birmingham were worth, but he believed they were rated at £500 per annum.

Mr. ASPINALL, on behalf of the railway companies, said he did not propose to ask the witness any questions, as the question which he wished to raise would probably better come before the committee on the clauses.

Mr. *G. Heaton*, vice-chairman of the Staffordshire Company, was called for the purpose of being examined by the petitioners, and, in reply to Mr. VENABLES, he said that the intention of the provision as to "undivided profits" was, that if, when the transfer was completed, there was any profit beyond what was necessary to fill the reserve-fund, it should be retained by the shareholders. He could not give any further particulars as to the value of the company's property beyond the £639,221 at which they stood in the books of the company. He could not tell how much had been from time to time written off for depreciation.

Mr. STEPHENS said notice had been given to the promoters to furnish the petitioners with the "cost" of the company's works; in answer to which all they had got was a valuation as to their present worth. What they required was what had been spent on the works, and what had been written off for depreciation.

The CHAIRMAN said that would involve a long examination of the company's accounts.

Mr. STEPHENS said he would be satisfied if the promoters took the value five years ago, and furnished an account of what had been spent and written off since.

Witness thought it possible to obtain that information, and promised that it should be supplied.

Mr. *R. Jones*, examined by Mr. MICHAEL.

I am the engineer-in-chief of the Commercial Gas Company, London. I investigated the state of the works of both the gas companies of Birmingham in 1874 for the corporation. The purport of that report was that, as regards these companies, they had practically exhausted their powers. As to working order, the works were in excellent condition. I considered the corporation was giving a fair price for the works, and this is confirmed by what I know of the prices given in other towns. I am in favour of the transfer, believing it will be advantageous in several ways. One great advantage will be the saving from amalgamating the services, as at the present time two mains through 140 miles of streets involves a double leakage. Even if there were to be no transfer, I should consider an amalgamation of the two companies and their services as most desirable. Such transfers as that sought by the present bill have generally been very successful, and work beneficially for the gas consumers, as the tendency has been to reduce the price of gas. The West Bromwich works are very valuable. I am of opinion that the various districts should be supplied by the corporation as heretofore by the company, and not allowed to have a distinct supply. It would be more economical were the full powers of the companies transferred *en bloc* to the corporation, who would work the gas supply for Birmingham and the surrounding district.

Cross-examined by Mr. VENABLES: I believe that corporations manage gas undertakings quite as well as private companies. In estimating what is a fair price to give for such concerns, the commercial value must be attached to the whole concern, and not restricted to the manufacturing works.

By Serjeant SARGOOD: No doubt an amalgamation between the two Birmingham companies would be productive of economy, and there would be a prospective advantage to the public from a reduction in the price of gas.

Serjeant SARGOOD: The corporation ought to be able to sell gas at a lower price than the two companies.

Witness: And therefore, being under the control of the ratepayers of Birmingham, would be compelled to do so.

Serjeant SARGOOD: I am not sure whether the ratepayers will compel the emptying of their own pockets. Seeing that they ought to be able to sell gas cheaper than the companies, there would be no pretence for their charging more?

Witness: No.

Serjeant SARGOOD: Do you think there would be anything unfair in binding them down to a lower price?

Witness: If you were to do so, you would be doing what has not been done in the case of any other corporation.

Serjeant SARGOOD: You do not say that there would be anything inequitable in binding them down not to charge more?

Witness: That is a matter so much in the hands of the committee, that it is not for me to decide. As far as my experience has gone, in every town where the gas supply has been transferred to the public authorities, a reduction in price has followed. As I understand Birmingham—and I know it very well—the majority of the ratepayers are consumers, and would be more interested in the price of gas than in the amount of the rates.

By Mr. CLERK: The "London" burner, to be used in testing the gas according to the provisions of this bill, will register a higher illuminating power than the burner hitherto used by the Staffordshire Company. It is a burner which consumes the gas more perfectly. I do not at all suspect that advantage will be taken of this circumstance by the corporation to supply an inferior gas. I take the insinuation to be this—that the adoption of this burner would enable the corporation to manufacture gas of inferior quality, which, by means of this new burner, would give the same illuminating power, and would be charged at the same price as better quality gas. I may say that in London improved burners have been adopted, from time to time, which have largely increased the illuminating power of the gas; but in no case has a single company adopted the plan which the question implies might be done by the Birmingham Corporation. I am convinced that such a thing would not be sanctioned by the corporation.

The CHAIRMAN: What is the quality of gas prescribed by the bill?

Mr. MICHAEL: Fifteen candles. Fourteen candles was originally inserted, but the standard was raised in the House of Commons.

In answer to Mr. STEPHENS, witness said that in principle he did not approve of corporations roving about, and buying up other districts than their own. The Corporation of Chester had gone roving about picking up all the villages round. The Birmingham Corporation was not doing that, but was purchasing an undertaking already supplying those places.

Mr. HAYES (town-clerk of Birmingham) put in the agreements between the corporation and the gas company.

In cross-examination by Mr. CLERK, he said he received a letter from the local authority of Tipton, asking for permission to examine the West Bromwich works. As the corporation had no power over the Staffordshire Company's works, he wrote to the solicitors of that company, telling them that they considered the applicants had no right to the information sought, but that they left the matter entirely in the discretion of the company.

By Mr. STEPHENS: By one clause of the bill the corporation took power to borrow no more than two millions sterling, except with the consent of the Local Government Board. The corporation were also promoting a water bill. The two bills together, in round numbers, represented about £3,000,000.

Serjeant SARGOOD: There are, at any rate, two very practical ideas here. You having bought up this concern on whatever terms, the outside districts want to buy the distributing plant of those districts on certain fixed prices?

Witness: Yes.

Serjeant SARGOOD: And you put in the 36th clause to meet that?

Witness: We did not put it in in the first place; but it was done on the suggestion of the committee of the other House.

Serjeant SARGOOD: And the outsiders think it does not meet it?

Witness: On the contrary, the majority of the outsiders do.

Serjeant SARGOOD: The outsiders who are here opposing do not think it meets the case.

Witness said that on the other hand those who had withdrawn their petitions had a contrary opinion.

Serjeant SARGOOD: Until we buy we want your guarantee that you will not raise the prices, and that you deny?

Witness: That we deny.

This was the case for the promoters.

Mr. VENABLES then addressed the committee on behalf of the Smethwick Local Board. He said he thought it would appear that they were absolutely compelled, in self-defence, to appear against the bill. What would have been more beneficial to Smethwick would have been an amalgamation between the two companies, without a transfer to the corporation. The reserve-fund of the Staffordshire Company was nearly full, and they must obviously soon have reduced the price of gas. The companies introduced a bill for amalgamation, but it had been abandoned in consequence of the corporation bill, so that the Smethwich district were at once losers of what might have been converted to thousands of pounds. But for the Birmingham Corporation, they would have had the amalgamation, which would have been beneficial to them, for whatever saving would have been effected would have gone to Smethwick in the proportion of their consumption. The corporation was not identified with the interest of the outside districts, but it was identified with the interests of its own ratepayers. The corporation were to them strangers. The company was now limited in its profits, and the outside districts were in their proportion residuary owners of the surplus; whereas, if the present bill passed, the corporation would be unlimited in their profits, and the corporation alone would be the residuary owner of the surplus. Mr. Chamberlain treated it as a sort of affront when it was suggested that the ratepayers of Birmingham might possibly prefer to keep up the price of gas to reduce the rates. He really could not understand why Mr. Chamberlain should say that as honourable men they would not do it. Why should not Birmingham, as Manchester had done, lay out large sums from the gas profits in the provision of expensive public buildings? As to the question of honour, it had never been the course of wise legislation to set the honour of men in opposition to their interests. He thought these considerations fully justified the opposition; but, in addition to that, he contended that the option of purchase given to the outside districts was not accompanied by fair terms. It might be worth the while of the corporation, for advantages which Birmingham alone would gain, to give a very liberal price; but he did not consider it reasonable that the outside districts should have to give that high price also. The deduction of one-fifth before asking the districts for their proportion was not enough. First of all, the whole bargain ought to be taken into account. The Birmingham purchase, being at a cheap rate, enabled the corporation to pay the Staffordshire Company more, and this should be taken, with the Staffordshire purchase, as the basis of calculation, and then, in consideration of the West Bromwich works, they should allow, not a proportion which would debit the outside districts with the whole commercial value, but with a commercial value distributed in proportion to the material value of the distributing and manufacturing works. He contended that though the corporation, in the case of Smethwick exercising powers of purchase, would no longer earn a commercial profit in that district, yet they would, by retaining the West Bromwich works, relieve themselves from the necessity of constructing new works elsewhere.

The CHAIRMAN asked whether it would not be possible to arrive at some calculation apportioning the profits earned in the various districts.

Mr. VENABLES said the calculation would be a very difficult one. As far as his petitioners went they would be quite satisfied with the alternative of supplying themselves if they could only get fair terms.

The CHAIRMAN said he saw by the map that there were several other outside districts besides those opposing the bill.

Mr. DUGDALE said that some of them opposed in the House of Commons, but were now satisfied.

FRIDAY, JUNE 25.

Mr. *Bramwell*, C.E., examined by Mr. VENABLES, said he had considered the circumstances of the proposed transfer. If the borough of Birmingham alone were concerned, there would about be a balance of advantage and disadvantage; but when he considered the position of the outside districts in the present case, he thought those districts would be very much injured by the acquisition of the undertakings by the corporation. The corporation had made themselves liable to pay to the Staffordshire Company in perpetuity the maximum dividend that Parliament permitted that company to earn; and they had also, as part of the bargain, given up that which might amount to from £50,000 to £60,000 of money, which, although it would never have been distributed among the consumers, would be useful to them in mitigation of the gas-rates. As regarded the £10,960, that was a benefit to the consumers under the company, because it was capital embarked in the undertaking, and not bearing interest. So far as that was concerned, the consumers had the full benefit, but now, as he understood the bill, that was to be distributed among the shareholders, whereas otherwise it could never have been distributed among them except by express parliamentary sanction. The corporation proposed to retain the maximum price of gas of the Staffordshire Company, 4s. The economical advantages which might be gained by the transfer could be effected by an amalgamation of the two companies, in which case the outside consumers would participate in the advantage gained. If the bill passed as it stood, the interest of the corporation with regard to the price of gas would be to keep it as high as possible.

Mr. VENABLES: Supposing that the bargain between the corporation and the companies is confirmed, it appears that there would be two ways of protecting the consumers—one as suggested by the committee yesterday, of providing that they should have a share of the profits, and the other of making them altogether independent?

Witness: Yes; the outside consumers, that is to say.

Mr. VENABLES: What the corporation now propose is to allow them to become independent and procure their own gas.

Witness: Well, they propose that in words, but they couple it with conditions which would make it perfectly certain that it could not be accepted.

Mr. VENABLES: That is to say, it is a question of price.

Witness: As I understand the terms, the price is such as would make it certain that no independent body could purchase.

Sir E. BECKETT said his friend was raising a question which was substantially one of clauses, and if Mr. Venables would tell the promoters what he wanted instead of the 36th clause, it might save a great deal of trouble.

Mr. VENABLES said his opposition at the present time was as to the preamble. They wished, so long as they were under the corporation, to be protected, and that the corporation should not have the power they sought unless they were protected; and, in the second place, they wished to have fair terms on which they might become independent.

The CHAIRMAN: Would it not be well to consider what the terms are which the petitioners would consider fair?

Mr. VENABLES said the further questions he proposed to put to Mr. Bramwell would bear upon that point. (To the witness:) First, taking the terms as proposed in clause 36 in the bill. The first proposal is, that the local bodies should assume as a basis of calculation the bargain between the corporation and the Staffordshire Company alone. In your opinion is that the true basis?

Witness: No; it appears to press severely on those who desire to purchase.

Mr. VENABLES: Is it your opinion that the two bargains ought to be considered as one, for the purpose of the basis of calculation?

Witness: I think so, and I think I can give a very good reason. The corporation has made two bargains—one with the Birmingham Company, which is by no means an onerous one, and one with the Staffordshire Company, which is very onerous. The fact that any outlying district might have been supplied by the Staffordshire Company was a matter of accident, as it might have been supplied by the Birmingham Company. I think it would have been unfair in such a case that the outlying district should take the advantage of the good bargain with the Birmingham Company, without participating in the disadvantage of the bargain with the other company. I have no doubt that the corporation, having made a good bargain with the Birmingham Company, were able to make a rather bad bargain with the Staffordshire Company, for it was part of one transaction. Supposing there had been a third company with a capital of £50,000, that company might have made almost its own terms with the corporation, and the latter might have had to pay 20 per cent. per annum instead of 10 per cent. It would have been very unfair in such a case if an outside district supplied by that third company should have had to pay for its independence on the basis of the sum paid to that company alone. It seems to me that the fair basis is that the whole of the purchases should be fused into one, and that should be taken as the basis of settlement with an outlying district. There is another reason why that should be so, and that is, that these two companies had a bill for amalgamation, the benefits arising from which would have been obtained by consumers in the outlying districts, as well as those within the borough. Practically, the corporation could not get one company without the other, and therefore the less they gave to the one the more they could give to the other. The provision that the local authorities should have to pay four-fifths of the capitalized value of the annuities to the Staffordshire value for the distributive plant of their districts appears to me most unreasonable. I agree with a statement by Mr. Jones, yesterday, that the distributive plant may be estimated as worth one-third of the complete works. Only one of the sets of works in the borough, at Birmingham—the Saltley works—is capable of large extension, and as extension is required, the West Bromwich works remaining in their hands will be not only so much material property, but a property immediately producing profit. The retention of those works will enable the corporation to avoid laying out capital in new works. My scheme for settling the fair price to be paid by the outside districts, in case they wish to make their own gas, is this: fuse the two bargains into one; capitalize the annuity bargain at 20 years purchase; take one-third of the capital sum so arrived at, representing the distributive plant; and then make a rule-of-three sum—as the gas consumed in a particular district in the year 1875 is to the total gas produced by the two companies, so should be the purchase-money of that district to the third of the capitalized amount paid by the corporation.

By Sir E. BECKETT: I am aware that there was parliamentary power to the corporation to buy the Staffordshire Company by agreement, but I believe that power is obsolete, owing to the large extension of the concern since that power was given. It is, however, a legal question which I do not profess to decide. There will be a saving of £2000 a year of directors fees by the transfer to the corporation. I do not know the market value of the shares of the two companies just prior to the agreement with the corporation.

Mr. CLERK, in addressing the committee on behalf of the Tipton Local Board, said the objections of his clients amounted to this—that, however much advantage the bill might be to Birmingham, it must be injurious to the outlying districts. This was so apparent that, on the previous day, the committee threw out a suggestion as to whether the outlying districts might not, to some extent, share in the great profits which would be made by reason of the amalgamation, and the getting rid of directors fees. In order to remove that difficulty in the House of Commons, a suggestion was made that a clause should be inserted which would enable the outlying districts to buy upon equitable terms; and, in order to comply with that suggestion, the promoters put in clause 36. The injury to the outlying districts might be obviated by some provision by which they should share in the profits, or the corporation should be bound to sell to any of the outlying districts upon really equitable terms, not upon the absurd and illusory terms now contained in clause 36.

Mr. *G. W. Stevenson*, C.E., examined by Mr. O'HARA, said he had been concerned on one side or other, or else as arbitrator, in nearly every transfer of gas-works to public bodies which had taken place. He was well acquainted with the district supplied by the Staffordshire Gas Company. He was present when the corporation bill was brought before the committee of the House of Commons.

Mr. O'HARA: Is there anything particular in the terms of transfer proposed by this bill?

Witness said the Birmingham Company were to be bought out-and-out at a sum which amounted to about 19 years purchase of the statutory maximum dividends, while the Staffordshire Company were to be bought by the payment of annuities equal to the maximum statutory dividends the company could earn. The latter company would retain their reserve-fund—they would reserve all their assets, and put upon the corporation all their liabilities. That was a very unusual circumstance. He had never known such a thing in the case of a transfer. In other cases which he had known, wherever the corporation had secured a company its maximum dividend, the company always stepped out and the corporation stepped in, taking liabilities, assets, floating capital, and everything else. In this case the corporation would not take to the floating capital. Being unlimited by the Gas-Works Clauses Acts or any special restriction of profit, they would be at liberty to earn a greater profit than the company were allowed to make.

The CHAIRMAN: In any of these transfers to local authorities with which you have been acquainted, has the limit of maximum profit been preserved?

Witness said he knew of no such case. The gas supply of the outlying districts had hitherto been very satisfactory. The maximum price the company were authorized to charge was 4s., but they had never charged so much within his recollection. He believed the effect of the bill, if it passed in its present form, would be in time to make the Corporation of Birmingham the richest corporation in the kingdom. He had considered the operation of clause 36, and considered it was a very unfair one. It would be impossible for the outlying districts to purchase under it. He concurred generally with the evidence on this subject given by Mr. Bramwell. With regard to testing the quality of the gas, he found that under the Staffordshire Company's Act the gas had to be tested at a distance of 1000 yards from the works, and they used a burner called the Birmingham burner. The corporation, although they substituted 15 for 14 candles as the standard of illuminating power, proposed that the testing should take place at the works, and that the burner used should be Sugg's "London" Argand burner No. 1, which gave a higher result than the Birmingham burner. He thought it highly important that the gas should be tested at the place where it was to be consumed. Gas undoubtedly lost a certain part of its illuminating power by transmission along the mains, but the greatest loss was in the first 1000 yards.

By Serjeant SARGOOD: Witness considered that the value of the distributing plant, in comparison with the value of land, manufacturing works, storeage, and buildings, might be taken as one-third of the whole.

Cross-examined by Sir E. BECKETT: The inhabitants of Birmingham could bring moral pressure to bear on the Town Council to supply a good quality of gas. The outside districts could not bring that pressure, and the constituents of the council might be content with a lower quality in order to benefit their rates.

By Mr. CLERK: Clause 36 is a very fair clause, except as to the terms, and it does not say anything about compelling the corporation to sell. No evidence was given of the equity of the clause before the committee of the House of Commons.

By the COMMITTEE: Witness considered that clause 37 bore hardly upon the local authorities. There was a large main passing through the West Bromwich district to supply Darlaston and Wednesbury, and which was also used as a feeder to mains right and left for the supply of West Bromwich. If West Bromwich were to purchase, that main would be larger than was required, and the local authorities would be obliged to lay down a new and independent main to preserve the connexion between Birmingham and Darlaston and Wednesbury.

Serjeant SARGOOD: It would be a prohibition to their purchasing?

Witness: I do not say a prohibition. I think it would be a hardship.

Mr. G. SOMERSET, on behalf of the West Bromwich Improvement Commissioners, said the power of purchase provided by the bill was accompanied with such onerous conditions as to make purchase simply impossible; and if those whom he represented did not purchase, they would be always under the rules of the Corporation of Birmingham without any restraint upon them, and without any interest in common between them. The West Bromwich Commissioners were instituted since 1845, so that when in that year power of purchase was given to the Birmingham Corporation over the Staffordshire Company, the inhabitants of West Bromwich had no public body to protect them, therefore that power of purchase was entirely nugatory. At the present time West Bromwich had a population of 50,000 or 60,000 inhabitants, which was increasing probably more rapidly than the population of any of the other outside districts. They had coal existing in large quantities—coal especially adapted for the making of gas—and they had various large manufacturing industries. They consumed 110 million cubic feet of gas per year, and they had some manufacturers who themselves consumed over 3 million cubic feet, whilst there were a considerable number more who consumed over 500,000 cubic feet. That would give the committee some idea of the sort of district which was proposed to be put under the Corporation of Birmingham. He trusted that if their lordships passed the principle of the bill, they would see that those whom he represented were put in a position to take care of themselves, so that they should not be left to the mercy of the Corporation of Birmingham. This bill could only be passed upon public grounds, having reference not only to Birmingham, but to all the surrounding districts. He had nothing to do with the benefits, or the contrary, to the ratepayers of Birmingham, which might result from the proposed transfer; he wished them every prosperity, but he also wished that those whom he represented should be left where they were, under the law. He wished to call attention to the unlimited power which the bill gave the corporation to borrow money, for which his district, amongst others, were to be the security.

The CHAIRMAN: On what security?

Mr. SOMERSET: On the security of our taking gas and paying for it.

Serjeant SARGOOD: On the security of the gas-rates.

Mr. DUGDALE said that was limited by the sanction of the Local Government Board.

Serjeant SARGOOD: That means nothing. We should have no *locus standi* before the Local Government Board.

Mr. DUGDALE said that if the Local Government Board held an inquiry, they would hear all parties.

Mr. SOMERSET said they had no *locus standi* before the Local Government Board under the present bill, but if they had they would have no chance in opposing an application by the corporation.

The CHAIRMAN said he thought the Local Government Board would hear all parties interested.

Mr. SOMERSET proceeded. He wished to know why a limitation of profits should not be imposed upon the corporation as upon the gas companies. Those whom he represented refused to be left to the honour of anybody, and they contended that it was wrong legislation. If the committee should see fit to pass the preamble of the bill, he asked their lordships to put in clauses which would protect the outside districts in a different way to that which was proposed by the promoters. They asked to be protected against gentlemen who could only, and did only, think of the interests of their own ratepayers—ratepayers who must be indifferent—and whose interests might probably be antagonistic to the interests of the ratepayers outside.

Mr. *R. Farley*, chairman of the West Bromwich Commission said that in 1871 the population of his district was 47,908, and the present estimated population was 50,000. Besides large manufacturing works, he believed West Bromwich had more ungotten coal than any other parish in South Staffordshire. The area of the district was nearly 6000 acres. He had considered the bill now before the committee, and in its present form he thought it would be very injurious to the interests of West Bromwich. Last year West Bromwich consumed, according to the evidence of the mayor, 109 million cubic feet of gas, or about 1-15th of the total quantity sold by the Staffordshire Company. He had considered clause 36. One-fifteenth of the purchase-money of the Staffordshire Company would be £97,150, and that less one-fifth, or 20 per cent., in respect of the West Bromwich works, amounting to £19,430, would leave £77,720 as the sum to be paid by West Bromwich, under the clause in question. To that would have to be added the cost of new manufacturing works, gasometers, and new mains, £60,000, making £137,720 as the sum which West Bromwich would have to pay for the right and the means to supply itself with gas. Interest on that sum at 4½ per cent, which was the rate which the West Bromwich Commissioners had to pay, would give £6197 as the annual cost. The clause as it stood was illusory, being so framed as to prevent any outside town from purchasing. He considered it would be degrading to West Bromwich to be dependent upon the Corporation of Birmingham for the supply of one of the first necessities of civilized existence. The Staffordshire Company, speaking generally, had supplied the district very well. At present the gas-rates were unnecessarily high, owing to the endeavour on the part of Birmingham to acquire the works; otherwise he believed, the price of coal having fallen, there would have been a reduction in the price of gas, and both Birmingham and West Bromwich would have been supplied at the rates which had ruled for the past nine years. He found that the total quantity of mains of the Staffordshire Company in the West Bromwich district was 5509 tons; estimating those at the value of £7 per ton as a going concern, it would give £38,563 as the value of the mains within the limits of West Bromwich. Of that quantity, however, the corporation proposed to retain 2905 tons, which, at £7 per ton, would amount to £20,335. Then there were certain mains which the corporation did not propose to retain, but which it would be impossible for the West Bromwich authorities to utilize, amounting to 1107 tons; making a further deduction on that account; there would be 1495 tons of mains which the West Bromwich authorities could use, and for these, if they were charged £7 per ton, which he thought a proper value as a going concern, they would have to pay £10,465. As the bill stood, West Bromwich, under clause 36, would have to pay £77,720 for useful mains of the value of £10,465, and a quantity of meters, which they might value at £5600 as a going concern.

By Mr. DUGDALE: The Commission ought to pay a premium for the business over and above the valuation he had given, but he would not say what he considered would be a fair sum.

Serjeant SARGOOD, on behalf of the Oldbury Local Board, said he was quite willing that both this and the water bill which the Corporation of Birmingham were promoting should pass, provided no injury was done to the people outside. With regard to power of purchase to the outside districts, he contended that they should have the privilege of purchasing the distributive plant of their respective localities as part of a going concern at a price to be assessed by arbitration. That was what he had all along proposed, but the promoters would not listen to it, and had only given the 36th clause, which was a mere delusion. The outside districts were, according to its provisions, to pay certain proportions so grotesquely absurd and so utterly at variance with all rule, that the clause was utterly illusory. He and the other opponents were now before the committee for the purpose of guarding against an irrevocable approval of the transfer without securing an equitable principle of purchase. Several competent witnesses had told the committee that one-third of the total value of the concern might be taken as the value of the distributive plant—in other words, 5-15ths; but, instead of 5-15ths, the districts were to be required to pay 12-15ths. Although he had the highest opinion of the honour of the mayor and other gentlemen who had appeared before the committee as promoters of the bill, it was well known that corporations had no bowels, mercy, or conscience, however much individuals might have. The petitioners, therefore, asked that, while they should have equitable power of purchase, they should also have some protection against the corporation by way of limitation during the interregnum between the transfer to the corporation and the purchase by the districts.

Mr. MICHAEL, replying on behalf of the promoters, contended that ample protection was afforded to all the petitioners by the provisions of the bill as it stood, and particularly by the securing of the same charge for gas to outside consumers as to those within the borough. He also defended the equity of the terms accompanying the option of purchase given to the outside districts, pointing out that what was purchased was rather a certain profit, and the means of making it, than a mere material property. With regard to the deduction of one-fifth in respect of the West Bromwich works, that was the value at which those works now stood on the books of the company, and he knew of no fairer way of ascertaining the value of those works than by taking it from the books.

The room was then cleared, and, on the parties being again called in,

The CHAIRMAN said the committee would not decide upon the preamble until their next meeting. In the meantime they wished to suggest whether it would not be possible to come to some arrangement with reference to the value of the works in the event of purchase by the local boards; whether the promoters could not strike out the price from the bill, and say it should be referred to arbitration. The committee thought that the valuation of gas-works depended upon so many technicalities that it would be well to frame a clause referring it to a competent valuation. Then there was another point which they wished to have considered, and that was whether some arrangement could not be come to whereby any profit over 10 per cent. should be distributed to the local authorities, or, where there was no local authority, to the board of guardians for the relief of the rates.

MONDAY, JUNE 28.

Sir E. BECKETT said that the remarks of the chairman, at the close of the last sitting, had been carefully considered by the promoters of the bill. He understood the first of those suggestions was that some arrangement should be come to with regard to the valuation for the repurchase of the works in the event of any of the local authorities wishing to have their supply in their own hands. Their lordships intimated that it was a question involving so many details and technicalities that it would be better to frame a clause referring it to arbitration by competent persons. The other suggestion was that the promoters should consider whether they could not consent to an arrangement by which any profit over 10 per cent. should be distributed rateably to the local authorities or boards of guardians. With regard to the first point, he thought they had adjusted it to the satisfaction of all parties.

Mr. VENABLES denied the correctness of the last statement.

Sir E. BECKETT regretted if he had misunderstood the view taken by the other side. With regard to the proposition for enabling the outside districts to participate in the profit above 10 per cent., the promoters having considered it, found it quite impracticable. They could never hope to carry out the provisions of the bill with any degree of satisfaction to their own consti-

tuents, if one of those provisions was to be such as was claimed by the opponents. Therefore, should the committee decide against the promoters on that particular point, the failure of the bill must necessarily follow.

The CHAIRMAN: The proposal only applies to any profit above 10 per cent.

Sir E. BECKETT said he would be glad if their lordships would say whether the intention was 10 per cent. in addition to the amount required for paying the annuities.

The CHAIRMAN: Ten per cent. besides what you are bound to pay by the bill.

Sir E. BECKETT: We should not make any objection to that.

Mr. VENABLES said under the existing state of circumstances the consumers were entitled to any surplus in excess of 10 per cent., whereas now if the corporation took 10 per cent. in addition to the sum for paying the annuities, the consumers would only get the surplus over 20 per cent. Again, supposing the corporation made another 10 per cent. besides what the companies earned, the consumers in the outlying districts would be much injured.

Mr. CLERK said he understood the suggestion of the committee to be that, with the proceeds of the manufacture and sale of gas, the corporation should first of all pay to the vendors the sums for which they were liable, and that of the surplus, which the mayor estimated at £19,000 a year, the corporation should receive only 10 per cent., the remaining 9 per cent. being divided among the local authorities in proportion to the amount of gas consumed within their municipal areas. He thought that would be very easily carried out, and would be of some advantage to the outlying districts.

Sir E. BECKETT said the promoters agreed to the proposition of the committee in reference to the settlement of the purchase price by arbitration, and he submitted the following clause for carrying it into effect:—"If any sanitary authority or authorities within the limits of supply of the Staffordshire Company shall bring in a bill in the next session of Parliament for the purchase of that portion of the gas undertaking now of the Staffordshire Company which is contained within the district of such sanitary authority or authorities, save and except the land of the company, and the West Bromwich works, and the main or mains extending therefrom to the borough by agreement, or, failing agreement, by arbitration under the Companies Clauses Act, then the corporation shall not oppose such application to Parliament except on clauses; and in case such bill shall pass into law, then if such sanitary authority or authorities give notice of their intention to purchase within three months of the passing of such Act, the corporation shall sell, and such sanitary authority or authorities shall buy, such portion of the undertaking in the manner before mentioned."

Some discussion ensued hereupon, and Mr. SOMERSET proposed an alternative clause as follows:—"If at any time after the passing of this Act any local authority within the limits of supply shall establish a company, and shall desire to purchase from the corporation that portion of the undertaking of the Staffordshire Company within the local authority, save the West Bromwich works, with the main and mains, and shall give to the corporation three months notice, in writing, of their intention to apply to Parliament, or otherwise to obtain the necessary purchase, the corporation shall sell to such local authority upon the terms following:—The purchase-money shall be a rateable proportion of the sum of £ , calculated upon the ratio of the gas supply of the district to the total supply. . . . And the corporation shall apply the proceeds of any sale under this section—in the first place, in paying off the claims of the Birmingham Company, and in paying all money necessary for the construction of works in the said gas undertakings, and for other purposes." A second clause provides that the corporation shall be at liberty to retain any mains or pipes within the district of such local authority which shall be necessary for the purposes of their gas supply, and such retention shall be paid for according to the terms decided upon by arbitration.

The room was then cleared for a short time, and, on the parties being readmitted,

The CHAIRMAN said: The committee approve the clause proposed by the promoters, with some alterations. Instead of the words "in the next session," we insert "in the next or next succeeding session of Parliament." The next alteration would be to put words at the end that "one arbitration should determine the principle of valuation as between the corporation and the local authorities."

Sir E. BECKETT: We are content with that.

The CHAIRMAN said the committee had further decided that by the word "surplus" they meant surplus after paying all the liabilities, including the annuities. Anything above 10 per cent. should be distributed rateably over the different areas.

The clauses were then proceeded with.

On clause 33, which provided for the mode in which the gas revenue should be applied,

Serjeant SARGOOD submitted that all the corporation were entitled to was that they should stand in the position of the companies and take 10 per cent. on their existing capital.

Mr. BRAMWELL was recalled and examined by Mr. VENABLES: He said as he understood the proposal of the promoters, it was that the money to be paid by the corporation for two undertakings was to be capitalized, and taken as the basis on which the corporation were to earn 10 per cent., which they were to keep themselves, any surplus over that being divided between the corporation and the outlying districts in proportion to the gas consumed proportionately by the area of the corporation and the outlying districts. The result of that, as he understood, would be this: The capital of the Birmingham Company was, he believed, £300,000, and the capital of the Staffordshire Company about £650,000, together £950,000, or, to make the matter simple, £1,000,000. The capitalization of the annuities to the Staffordshire Company had been put down at 25 years purchase, amounting to a million and a half. Adding to this the lump sum to be paid to the Birmingham Company, it gave them in round numbers two millions. With the companies the highest dividend they could pay was an average of between 8 and 9 per cent., or not more than £80,000 a year. Under the clauses suggested by the promoters, the consumers would be called upon to pay £200,000 a year, and the whole of that was to go to the corporation. If the limit of 4s. would admit of it, the amount of profit might reach £210,000, in which case the extra £10,000 would be divided rateably. His own opinion was that in all probability no such surplus would ever arise. As well as he could make out, within the statutory limit of 4s. on the price of gas, the corporation could just make 10 per cent. upon the proposed million of capital.

Sir E. BECKETT said the witness appeared to assume that the corporation were going to get the whole of that 10 per cent. themselves. They would have to pay, until the purchase was completed, 5 per cent. upon £450,000, as appeared by the agreement. That would be £22,000 a year; then the gas annuities would be £52,290, the two sums making together £80,000. Suppose 10 per cent. were earned, which could not be for many years to come, they would have to take from the £200,000 £80,000 or £81,800, which would leave about £20,000, or under 6 per cent. It had been said that companies upon new capital were only allowed 7 per cent., but the corporation in this case would not get more than about 6 per cent., for though the gross sum would be 10 per cent., they would have to pay away 4 per cent.

The room was again cleared, and, on the readmission of the parties,

The CHAIRMAN said the committee withdrew their suggestion as to the per centage clauses altogether.

The remaining clauses, with some alterations, and the preamble were then agreed to, the arbitration clause being ultimately settled in the following terms:—"If any local or sanitary authority or authorities within the limits of supply of the Staffordshire Company shall bring in a bill in the next or next succeeding session of Parliament for the purchase of the portion of the gas undertaking, now of the Staffordshire Company, which is contained within the district of such local or sanitary authority or authorities, save and except the land of the company and the West Bromwich works, and the main or mains extending therefrom to the borough, by agreement, or, failing agreement, by arbitration under the Companies Clauses Act, then the corporation shall not oppose such application to Parliament, except on clauses; and in case such bill shall pass into law, then in case such local or sanitary authority or authorities give notice of their intention to purchase within two months after the passing of such Act, the corporation shall sell, and such sanitary authority or authorities shall buy, the portion or portions of the said undertaking in the manner hereinbefore mentioned; and one such arbitration shall determine the whole principle of valuation as between the corporation and any other authority or authorities within the limits as aforesaid, provided that before any arbitration such as aforesaid shall be held, one month's notice in writing shall be given by the corporation to each of the local authorities or sanitary authorities within the limits of the Act, of the intention of the holding, and of the time and place, of the said arbitration; and each of such local or sanitary authorities is hereby authorized to appear and to be heard before such arbitration by their counsel, agents, and witnesses."

The CHAIRMAN was ordered to report the bill, as amended, to the House.

TUESDAY, JUNE 29.

BIRMINGHAM CORPORATION WATER BILL.

Sir E. BECKETT, Q.C., Serjeant SARGOOD, Mr. MICHAEL, and the Hon. E. C. LEIGH appeared for the promoters; Mr. VENABLES, Q.C., Mr. GRANVILLE SOMERSET, Q.C., and Mr. SAUNDERS for the Birmingham Water-Works Company, petitioners against the bill.

Sir E. BECKETT stated the case for the corporation. He said, in form, the bill was a purchase bill, but in reality it was a bill to enable the Corporation of Birmingham to raise the requisite capital for carrying into effect a power which they had had for many years, and which there was not the slightest doubt they possessed now. It was set forth in the preamble that, by the Birmingham Improvement Act (1851), it was enacted that the council might, after 12 months notice in writing of their intention, purchase the whole of the waters, engines, machinery, mains, and properties of the company, who were required and authorized to sell, on terms to be settled by agreement or arbitration. The water-works company, in their petition, denied that this power existed, and he might be asked why, if the corporation believed that they possessed the power, they did not content themselves with promoting a bill for raising money. The answer to that was that, had they done so, they would have had exactly the same battle to fight, because, though the company would not have opposed as a company, they would have opposed by some of their shareholders as ratepayers. On the whole, therefore, the promoters had thought it better that the whole case should appear on the face of the bill, and that it should authorize the corporation to do all the things proposed. In the original power of purchase the price was to be fixed by agreement or by arbitration; but the bill, in its present form, proposed to save the expense of arbitration by naming a certain sum in one of the clauses. That point was never discussed in the House of Commons, and it was entirely an open one. The promoters must put something in, and their lordships would be shown, in the course of the case, why a definite sum was named instead of arbitration. That course was by no means without precedent, for there were several cases, especially of gas companies, in which, after discussion in Parliament, a definite sum of money was inserted as the terms of purchase instead of arbitration; and he knew of one case—that of Glasgow—in which a bill was brought in with an arbitration clause, and it was decided that it would be better to substitute a definite number of years purchase. As to the reasons for bringing in this bill, the committee would observe that the grounds for purchase in the case of gas companies were entirely pecuniary, but in the case of a water company a very much more important ingredient came in, and that was the question of whether the water company supplied water as it ought to do. He had appeared in many similar cases to this, both for promoters and for opponents, but he had never been able to contend against the principle that the primary duty of a water company, overriding all their powers and privileges, was that of supplying pure and wholesome water. Of late years the town of Birmingham, which used to be spoken of as an unusually healthy town, had exhibited a steadily increasing death-rate, and the diseases from which this mortality sprang were precisely those which it was well known were attributable to bad water. At the present time there were no less than 4000 deaths a year due to that class of diseases. When, in 1870, the water-works company were before Parliament, the corporation sought to get imposed upon them the obligation of filtering their water, but the company resisted. Not only would the company not filter the water from their old sources of supply, but the water-rates had gone up. Whether from the badness of the water, or its dearness, or both, a great number of people, to the extent of 150,000, simply would not take the company's water—and the company could not compel them—but supplied themselves from what were called private wells. Everybody knew that private wells were surface wells, and surface wells were little better than sewage wells. Bad as was the water from the rivers Blythe and Bourne, it was better than the apparently clear water of the private wells of the town, which, when tested, was found to be most noxious. The corporation had the power of supplying some public baths belonging to the borough from deep wells of their own, and for the sake of the poor people, to save them from drinking of the sewage from the surface wells, the council put up stand-pipes in different parts of the town, from which they might take water free. The committee would hardly believe it when he told them that the water-works company instantly went to the Court of Chancery, and got an injunction preventing the corporation keeping up their stand-pipes, because they said it would interfere with their profit. He did not think that, in all the history of water-works companies, they would be able to find the parallel of that. The company would not let the corporation put up their stand-pipes, they would not accept the obligation to filter the whole of their water, and now they must take the consequences. It might be asked by the opposition why the corporation did not now go in for a regulation bill. The answer was that, in 1870, the corporation tried to get regulation clauses in the powers the company were seeking, but the latter refused to be regulated, saying that the corporation had powers of purchase, which they could exercise at any time, and that if the obligations as to filtering, which the corporation sought, were imposed, it would be only diminishing the value of the property which they might have to purchase. They now denied the existence of the purchase powers, and in one of the clauses they objected to being compelled, against their will and against all precedent, to part with their undertaking. That would be quite true if this was essentially a compulsory purchase; but the fact was, consent was given by the company in 1851, was renewed in 1854, was stated by themselves to exist in 1870, and in a precisely similar case was decided to be existing by the Court of Chancery in 1871. With regard to the terms of purchase appearing in the bill, he would only remark that the high price of 23 years purchase was inserted on his own advice. As arbitration was so expensive, he told the promoters to put in as high a price as they could, as then the petitioners might be satisfied with it, as were the parties concerned in the Rotherham and Glasgow cases. It turned out that they were not content, and therefore they might discuss the question at a later stage. Then the petitioners said the power sought by the corporation was objectionable, as the limits of supply extended beyond Birmingham to several parishes

outside. That was rather curious, since the people outside did not oppose, as they did in the case of the gas. What could it possibly signify to the company, seeing that they would get their maximum price either by their lordships decision or arbitration, whether the corporation supplied an outside district or not? They were a mere trading company, and their case in 1870 was that they were a mere trading company, and that so long as they kept their bargain with the town it would be unfair to put any additional obligations upon them. It was a singular fact, but a very strong one in support of the bill, that though the outsiders were wide awake about the gas purchase, they infinitely preferred being supplied with water by the corporation, rather than by the company; and the result was that none of them appeared in the House of Commons or before their lordships to oppose. With regard to the people inside the borough, though there was a large majority in favour of the gas purchase, the majority in favour of the water purchase was much larger, the town being practically unanimous. There was a petition signed by over 20,000 people in favour of the bill, but it was a curious thing that the water-works company had failed to get up even a sham opposition of ratepayers against it. It would have been worth their while if they could have got 2000 or 3000 ratepayers to support their opposition, but they had not done so. In conclusion, the learned counsel referred to the negotiations which had taken place, and to the proceedings in the House of Commons upon the preliminary objection raised by the petitioners to the bill being proceeded with.

Mr. *Hayes*, the town-clerk of Birmingham, was then called and examined. He deposed to the powers possessed by the corporation under the Improvement Act of 1851, and to the desirableness of the transfer of the water-works to that body.

In cross-examination by Mr. SOMERSET, he said it would be better that the works should belong to the town for many reasons, principally because the object of a private water company was to make as large a dividend as possible for the benefit of their shareholders, whilst it would be the duty of the corporation, as the sanitary authority—and he believed they would feel it to be their duty—to supply water as cheaply as possible, the public health and the comfort of the people being the primary consideration, and the profit, which was the primary consideration with shareholders, being the last with the corporation. The corporation had looked after the company with reference to the quantity, quality, and price of water, as far as their powers extended. If the corporation obtained their bill, they would not be able to levy a rate to be called a water-rate, but they would be able to supply water under the general provisions of the Sanitary Acts, and they could charge the cost to the borough improvement rate. That rate was now 2s. 3d. in the pound. He was convinced that the corporation had the power of purchase under the Act of 1851.

The CHAIRMAN said it was not worth discussing, as by the present bill the power would be given.

Mr. SOMERSET said, as the case was presented to the committee, it was asserted that the power remained. He would only say that in no instance, not even in the Neath case, where the water was admitted to be bad, had compulsory powers been imposed against a water company. Of course, it was open to the committee to establish a precedent, but he thought they would not do that, except under very peculiar circumstances.

In reply to a member of the committee, witness said he never knew a measure submitted to Parliament which was so popular with the people of Birmingham as this.

Mr. *Till*, borough surveyor, deposed to the cost of water required by the corporation, and the necessity, on sanitary grounds, that they should have control over the supply.

WEDNESDAY, JUNE 30.

Mr. *Till* was recalled and cross-examined by Mr. VENABLES as to his knowledge of the sources of the company's supply.

John H. Dadds, a storekeeper in the service of the corporation, gave evidence that the water furnished by the company and used in the street water-carts contained shells, leeches, shrimps, &c.

Alderman *Avery* deposed to the efforts of the corporation in connexion with the sewerage of the town, and the importance of obtaining a supply of pure and wholesome water for the inhabitants. Every year's delay in the acquisition of the undertaking of the company rendered it more difficult of accomplishment, owing to the increased value of the works, not only in respect to the substantial outlay upon them, but also in respect to the premium on their capital.

Alderman *Allen*, of Brighton, said the corporation of that town, under the advice of Mr. Hawksley, gave notice to the water-works company to buy their works by compulsion, but they subsequently came to terms. The result of the transfer had been beneficial. In the year 1874, when there was some fear as to the powers of one of their stations to give an adequate supply of water for the summer months, the corporation were able to go to a large outlay without delay to prevent any danger. If the works had been in the hands of the company, the fear of lessening their dividend would in all probability have caused them to defer the construction of additional works until a more convenient time.

Dr. *Hill*, medical officer of health for Birmingham, deposed to the sanitary condition of the borough, the state of the water derived from shallow wells, and of that supplied by the water-works company, the latter of which he had for some years systematically analyzed, and which he pronounced to be ineffectually filtered. If the transfer proposed by the bill before the committee was carried out, he had no doubt that good sanitary results would follow. In the first place, the corporation would thoroughly filter the water which required filtration, and in the next place he was sure they would endeavour to shut up the surface wells which proved so highly detrimental to the public health, and substitute pure water, having primary regard to sanitary considerations, and not profit. Since the bill was before the House of Commons committee, witness had made further analyses of the company's water, and found that it had improved, there being a considerable diminution in the amount of organic carbon and nitrogen. He attributed this improvement to the company having supplied more water from their deep wells, and less from the river sources.

In cross-examination by Mr. VENABLES, he said he was not aware that the company proposed to filter all the water they supplied. He thought it very probable that the bad health of Birmingham was attributable to the company's water.

Dr. *Frankland*, examined by Sir E. BECKETT, said he became acquainted with the water supply of Birmingham, as one of the Rivers Pollution Commissioners, in 1873. The company's supply was taken from deep wells and from rivers, but the proportion from the former was very small. The deep well water was very good, but the river water partly very doubtful, and partly very bad indeed. Plant's Brook furnished water which was very highly charged with organic matter, and unfit for domestic supply. The water from Witton Brook was a little better, but was also too highly charged to be suitable for drinking and dietetic purposes. The water of the Perry Brook, which he examined in 1870, was a little better than the other two streams, but was very strongly charged. The Blythe water he found in 1873 to be not much better than the Tame, which was so much polluted with sewage matters that the company were not allowed to take it for domestic supply. The Bourne was the best of the river sources, and the only one possessed by the company which, in his opinion, was at all fit for supply. In 162 towns, a list of which he handed in, the water supply was in the hands of the local authorities, and the best results had followed. He thought it highly desirable that this should be always the case.

In reply to a question by the CHAIRMAN, witness expressed an opinion that, even if filtered, the water supplied to Birmingham, except that taken from the Bourne, was not suitable for domestic purposes.

Professor BISCHOF, of Glasgow, gave the results of his analyses of the water, which convinced him that the quality was extremely doubtful.

THURSDAY, JULY 1.

Mr. *John Lowell*, a clerk of the works to the corporation, gave formal evidence identifying the samples of the water analyzed by Dr. Hill.

Mr. *M'Neill* gave evidence as to the increase in the water-rates during the last few years, and Sir *Edward Easton* and Mr. *Muntz*, M.P., as to the advisability of the transfer of the works to the corporation. Mr. *Bateman*, C.E., and Alderman *Chamberlain*, the mayor, followed in support of the same views, and this closed the case for the promoters.

Mr. VENABLES, in stating the case for the petitioners, called attention to the alleged powers of purchase possessed by the corporation, and said they did not exhibit much confidence in the reality of those powers by introducing clauses into the present bill to enable them to carry out their wishes in that respect. The corporation asked for power to raise a large sum of money to purchase the works against the will of the company, although time after time they had declined to exercise the powers they asserted were still in existence. As to the allegations of the impurity of the present supply of water, he reminded the committee that what the promoters proposed was to buy up that supply, which would therefore remain bad or good, whichever it was. If, however, it was contemplated going to other streams for an additional supply, it seemed to have been overlooked that they would be going to places where they would meet, on all sides, with very powerful opposition; for in these streams there were many who had a beneficiary interest, and who would fight the corporation inch by inch, and who, if they did not succeed against it, would certainly be awarded ample compensation. He was instructed to say that the company were prepared to lay down filter-beds for filtering the whole of the water; and this was the only thing that the promoters had shown to be wanting to make the present water supply all that could be desired. The scheme of the corporation was an ambitious project by which the whole of the present supply would be rendered of no avail, and the town would be involved in enormous and unnecessary expense. He urged that if the bill before the committee was passed, the council would have no further sanitary power beyond what they now possessed; and that there would result from its passing no advantage, either sanitary, economical, or mechanical. He should call witnesses to show that the company's water was both good and sufficient; and he hoped to prove, to the satisfaction of the committee, that there were no grounds of public expediency which would justify their giving consent to the purchase of the company against their will.

FRIDAY, JULY 2.

Dr. *Letheby*, examined by Mr. VENABLES.

I am professor of chemistry in the college of the London Hospital, and was for 20 years the medical officer of the City of London. As a public analyst, I have paid great attention to the condition of water and its sanitary effects. I have studied chemistry with a special view to the bearing of the condition of water on the health of the population of large towns. I am well acquainted with the condition of the water supplied to Birmingham, having made analyses of that water every month since the year 1871. The samples were taken by my direction without the knowledge of the company, and were analyzed at a private office. Speaking generally, the water was of very excellent quality.

The CHAIRMAN: Does this evidence apply to the well water alone?

Witness: No; it applies to the whole water supply taken together. My analyses show that the proportion of organic matter in the water is very small. In consequence of the evidence of Dr. Hill and Dr. Frankland, with regard to the condition of the water supplied to Birmingham, I was so much struck with the statements made, that I went with other chemists to Birmingham to investigate the matter for myself. That was on May 18 and 19 last. We were attended by the resident engineer to the company, and we examined all the works, and reservoirs, and wells. We took samples from the public taps, and made as full and careful investigation as possible. We visited the works at Whitacre, and we inspected the filter-beds there. There were seven of the longest filter-beds there I had ever seen. They were capable of delivering some 15 million gallons a day; but at that time they were not delivering more than one-fourth of that quantity. That was from the Blythe. The result of our examination of those samples showed the quality of the water to be very excellent. I am perfectly acquainted with the mode of construction of filter-beds. These were very well constructed, and covered an area of some four acres. After passing through these filter-beds the water was extremely good, and showed not the least taint of colour or impurity. We also inspected the reservoirs at Witton, and made examination of the water, which was of very good wholesome quality, though perhaps a little turbid. The Upper Witton reservoir has a capacity of 47½ million gallons, and the two lower ones 30½ millions, making a total of 78 million gallons. That water is not filtered at present; but when the filtration works are completed the whole supply will be perfectly wholesome. As I have said, the water is slightly turbid, and there is some green vegetation in it, which, however, is innocuous. The storeage capacity of the whole of the reservoirs is 184 million gallons, and the three reservoirs in course of construction will provide an additional storeage capacity of 432 million gallons, giving a total of 616 million gallons of storeage capacity. At present the storeage would be sufficient for a supply of 41 days.

Mr. VENABLES: What difference was there in the analyses made by yourself and the other chemists who accompanied you, as compared with those of Dr. Hill and Dr. Frankland?

Witness: The actual saline matter in our samples was found to be very small, and the presence of ammonia was likewise exceedingly small. Then the proportion of nitrates and of organic matter was less than in Dr. Hill's results.

The CHAIRMAN: When was Dr. Hill's analysis taken?

Witness: At the same time as ours.

Mr. VENABLES: Can you give in figures the comparative results of your analysis and of Dr. Hill's?

Witness: Yes. First, with regard to the presence of nitrate in our analysis, the proportion was ·165 to ·168 per gallon, whilst in Dr. Hill's it was ·205 to ·2058, being about as much again. Then the organic nitrogen in our analysis was from ·0203 to ·0300, and in Dr. Hill's it was from ·0273 to ·0336. There was very little difference in the proportion of carbon in the two analyses. From these results I deduce that, in the case of organic nitrogen, the great exaggeration is due to some imperfection in the mode of performing the analysis.

Mr. VENABLES: Was there any other impurity in the water with regard to which your analysis shows a difference?

Witness: Yes; in the case of chlorine, which is, to the mind of some people, an indication of pollution. Dr. Hill gives 1·144 per gallon, and we make it 1·298.

Mr. VENABLES: Your results are obtained from the analyses of four different chemists?

Witness: Yes. We found the total proportion of solid matter to be from 16·1 to 16·8, and Dr. Hill makes it 16·7 to 16·9.

Mr. VENABLES: Then the difference is not very great?

Witness: No; and, even taking Dr. Hill's figures, the results do not indicate an unwholesome quality of water.

Mr. VENABLES: Which are the elements which are most important, as affecting the wholesome condition of the water?

Witness: Albumenoid ammonia and organic matter; these are not present in any great proportion.

Mr. VENABLES: From your experience of the health of large towns, do you find that the quality of the water has any great effect with regard to the existence of diarrhœa?

Witness: No; I do not find that it has. In my experience I find that diarrhœa and similar diseases are rather due to the contamination of the atmosphere, the accumulation of filth, overcrowded dwellings, and the existence of cesspools, the emanations from which enter the poorer class of dwelling-houses. In Birmingham there are a very large number of cesspools, and there are 19,000 privies and middens, covering 13½ acres. I attribute the existence of zymotic diseases to those causes rather than to anything in the quality of the water.

Mr. VENABLES: Can you mention any other large towns where, although the water supply is good, the prevalence of diarrhœa is remarkably great?

Witness: There is Bolton, with a population in 1871 of 158,000, supplied with good water from the moors. The total deaths being 262 per 10,000, the proportion of deaths from diarrhœa was 81 per 1000 of the total deaths. Then there is Preston, also well supplied with good water, showing 96 per 1000 of the total deaths to be attributable to diarrhœa. In Salford, similarly situated as regards its water supply, the deaths from this disease were also 96 per 1000 of the total deaths. In Leeds, where the water supply is in the hands of the corporation, the deaths due to the disease were 99 per 1000 of the total deaths. In all these cases the prevalence of diarrhœa is, in my opinion, due to imperfect sanitary conditions, irrespective of the water supply.

Mr. VENABLES: Then what is the state of the case in Manchester, which has been so often cited?

Witness: The number of deaths from diarrhœa in Manchester was 99 per 1000 of the total deaths.

Mr. VENABLES: Can you give any instances on the other hand tending to show that where the water is not of good quality, the deaths from diarrhœa have been comparatively small?

Witness: Yes; Wakefield, which was reported by the Rivers Pollution Commissioners to be in a disgusting condition as regarded its water supply. About half a million of population drain into the river above the town, and the water from the river is filtered and purified for the use of the inhabitants. Only 66 per 1000 of the total deaths in Wakefield are due to diarrhœa, though the people may be said to drink their own sewage. There is another notable instance in the case of Doncaster, which is similarly placed as regards its water supply. There the deaths from the disease are only 31 per 1000 of the total deaths, or about one-third of what it is in Preston and Manchester. From these facts I conclude that the quality of the water has very little to do with the prevalence of diarrhœa, but that the disease is induced by the neglect of other sanitary measures.

Mr. VENABLES: Have you found these inferences borne out from your experience in London?

Witness: Yes. In London during the five years from 1855 to 1859 inclusive, the deaths from diarrhœa amounted to 41 per 1000 of the total number of deaths. Owing to the adoption of sanitary precautions during my term of office, though the water supply has not been altered, that rate has been reduced considerably, and in the five years ending 1873, the deaths from diarrhœa were only 31 per 1000 of the total deaths in London. I attribute this reduction to the getting rid of cesspools, shutting up the public pumps, preventing overcrowding, and similar sanitary measures.

Cross-examined by Mr. MICHAEL: I agree that an abundant supply of pure water is essential to the sanitary improvement of the poorer classes of our large towns. I consider London is well supplied with good water. I have examined the water frequently for the last 20 years, and I say unhesitatingly that the water from the New River Company and from the Thames at Hampton is of very excellent quality in itself, and as compared with that supplied to any of the continental cities. When water is filtered, I should not expect to find bivalves in it; but I have known of their existence in water in cases where it would have been impossible for them to come from the source of supply. They grow in the mains from some elements previously introduced. Such would not be the case supposing leeches and small fresh water eels existed in the water; they could not have grown from any of its elements.

By Mr. GRANVILLE SOMERSET: Notwithstanding these eels, or whatever they are, I have not the least hesitation in saying that the water is very excellent in quality. The existence of these creatures in the water merely shows that the water was not filtered. In Dr. Hill's analysis there is a large proportion of nitrogen and a large proportion of organic matter, but, practically, the purity of the water is only slightly different.

The CHAIRMAN: Do you consider it desirable that the whole of the water supply should be filtered?

Witness: No doubt it is desirable that it should be filtered and delivered free from impurity, no matter whether supplied by the corporation or by a company.

Dr. *Odling* examined by Mr. MICHAEL.

I am professor of chemistry in the University of Oxford. In conjunction with Dr. Frankland I made analyses of water for the Royal Commission on the Pollution of Rivers. I have had considerable experience in the investigation of the quality of the water supplied to large towns. Since February last I have made eleven investigations of the Birmingham water in conjunction with Dr. Letheby. I went with him and Dr. Voelcker and Mr. Gore to inspect the water company's works in May last, and I have an analysis of their water taken at the beginning of the year, and sent to me for examination. The results I have obtained in all my analyses accord closely with the majority of those of Dr. Frankland and Dr. Hill. As I have said, I have examined eleven different samples, and they show no striking difference as regards the wholesome condition of the water. They show that the Birmingham water contains, on the average, less than three one-millionth parts of organic matter and carbon, equal to about seven parts in one million of solid matter, or about half a grain in a gallon. That is the common result of all our analyses. From this I conclude that the water is particularly free from organic matter. I consider it admirable for domestic purposes. There is no evidence to show whether the organic matter is entirely animal or entirely vegetable, probably it is partly one and partly another; but that is only a matter of inference. In either case the quantity is exceedingly small, and there is nothing to show what the constituents are. I arrived at my results by the same process as that employed by Dr. Frankland. I heard Dr. Letheby's evidence, and have nothing of importance to add to it. I think all the water supplied to the town should be filtered, except the deep well water, which is naturally filtered. Filtration would remove the matters I have spoken of; but if the water were allowed to stand afterwards in reservoirs before distribution, they might appear again. They are not noxious; but they are not pleasant, and ought not to be there.

Cross-examined by Sir E. BECKETT: I was engaged on this matter in 1870. If I then gave evidence, the probability is that I said the water should be filtered.

Sir E. BECKETT: Then I have no doubt you were not examined, because, if the company found you were of that opinion, they would not ask you to give evidence. Do you know the condition of the Tame?

Witness: I know something of it by repute.

Sir E. BECKETT: What should you say of the water, from your knowledge or from what you have heard?

Witness: I should say it was not a fit source of supply.

The CHAIRMAN: Can you say what the condition of the river would be in 1876 if the Rivers Pollution Bill passed?

Sir E. BECKETT: I am afraid we cannot answer as to that. (To witness:) With regard to the presence of organic matter in the water, are there any means of forming a fair opinion as to whether their presence is due to the contamination of wells by sewage pollution?

Witness: Yes, there are ways of ascertaining the cause.

Dr. *A. Voelcker*, F.R.S., examined by Mr. SANDERS.

I am chemist to the Royal Agricultural Society, and have had large experience in the analysis of water for the supply of towns. I am personally acquainted with the sources of the Birmingham water supply, having personally visited the district, and gone over the watersheds. I have analyzed the water from the wells and the rivers on various occasions. I have made analyses of the water for years past. I know the nature of the watershed with which the river Blythe is connected. It is a thinly populated agricultural district. For 73 square miles there are 104½ acres for each person. I should not expect any sewage, in the ordinary sense, from a district like that. Most of the land is certainly not in a highly manured condition, as has been represented. The greatest portion is pasture land, and is not highly manured, even artificially. Pasture land, it is well known to any one in the least acquainted with the practice of English agriculture, is badly manured, all the manure being taken for the arable land.

The CHAIRMAN: Is it the fact that the watershed of the Blythe and Bourne is highly manured or not?

Witness: No; it is not highly manured.

By Mr. SAUNDERS: The waters of the Blythe and the Bourne have a slight yellow tinge at the fall of the year, from the decayed leaves and grass which find their way into the streams. The organic matter in the water is chiefly vegetable. There is very little animal matter in it. The vegetable matter would in a great measure be removed by filtration, and by the same means the colour of the water would be restored. The water, in my opinion, is one that can be safely drunk. The river water is wholesome, but not so good as the deep-well water. It is a fair average quality. The organic matter in the river Blythe is of vegetable origin. My reasons for stating this are, in the first place, the amounts of actual ammonia and organic nitrogen are small; the quantity of nitrates is small; and, lastly, the amount of chloride of sodium, or common salt, is small. When we find the proportion of all these constituents small—constituents found in all wholesome water—the inference is as I have stated. Common salt is not retained by filtration when the liquid retaining it is passed through the soil. Naturally we expect a large proportion in sewage or animal matters, and a greater proportion of common salt than in any other waters not contaminated. In the Blythe water the proportion of sodium is small, and the land has not been manured with any kind of manure for the last 25 years. If sewage matters found their way into the Blythe, from which the water company take their water, there would be a much larger proportion of common salt than what the analysis gave. I do not look upon the presence of common salt as a sure indication of sewage contamination, but it is a means of forming a pretty sound opinion on the matter, especially if the other fact is kept in view—that the quantity of ammonia and organic nitrogen are small. Independently of my knowledge of the district, I should say that the absence in large quantities of these constituents justifies the opinion that the water is not contaminated with animal matter. Since 1870 I have made analyses of all the water supplied by the Birmingham Company. The evidence I have given is applicable to the whole supply, and not merely to the river Blythe. The river Blythe contains more sulphate of lime than the wells. I can safely pronounce the water supplied to Birmingham to be of fair average quality for domestic and manufacturing purposes.

Cross-examined by Sir E. BECKETT: I think all the water should be filtered. I was not called in to give evidence on the filtration clauses in 1870. It is hardly a chemical question whether it is better that the supply of water to a town should be in the hands of the local authority. A good deal might, perhaps, be said on both sides, and at present I should not like to answer the question, as I have not devoted sufficient attention to that view of the subject to be able to give such an answer as would satisfy myself.

Sir E. BECKETT: Do you not think the corporation have a greater interest in supplying the best water than a private company?

Witness: The interest ought to be the same. My impression is that the corporation will not supply a better kind of water, nor at a cheaper rate; but there are reasons why it should be in the hands of the corporation. A corporation have a number of sanitary arrangements in hand, and it is desirable that all these sanitary matters should be under one control, not for economical, but for practical purposes.

Mr. *G. Gore*, F.R.S., teacher of chemistry at the Grammar School, Birmingham, said he had examined numerous specimens of the water supplied by the Birmingham Water Company, taken from taps in various parts of the town, and he could safely pronounce it a good average water. He had examined the filter-beds, and found they were in excellent condition. He had lived 20 years in Birmingham, and drank the water regularly supplied by the company, without its going through any filtration process, and never felt any ill effects from it. The surface wells of the town were very bad, and ought to have been shut up years ago.

Mr. *G. Heaton*, examined by Mr. VENABLES.

I am the chairman of the water-works company. Their present charges and dividends are regulated by the Act of 1855. The present supply of water is about eight million gallons per day. From the works already completed we can supply 17 millions; and by the authorized works, when these are completed, 23 millions. It has been the policy of the company to be always considerably in advance of the wants of the town's necessities. Storeage with us is a secondary consideration, as we have a constant supply, independent of storeage. Taking the wells and storeage together, there has never been the slightest doubt of our having an adequate supply at all seasons. The company have from time to time consulted the best authorities upon water supply, and will continue to do so. For the last two years and a half they have paid maximum dividends. The maximum dividends are 7 per cent. upon £336,000, and 8 per cent. upon £420,000. These amounts are the authorized capital. When all the capital is raised the average maximum dividend of the company will be something more than 7½ per cent. The company never paid the maximum dividends until two and a half years ago. The revenue of the company will increase as the supply increases; in fact, it has doubled about every ten years, and I believe it is certain that we would continue to pay our maximum dividends. At no distant time I think we shall have to reduce our rates. The works are in an efficient state, and second to none in the kingdom. The company have never had any complaints about their water supply except at times when proposals for transfer to the corporation are under discussion. The corporation have never concerted any measures with the directors for supplying water to small houses. We are quite prepared to assist the corporation in the matter, and would be glad of the opportunity to do so. We are also prepared to do all we can to close the surface wells.

Cross-examined by Sir E. BECKETT: We resisted the corporation in 1870 in reference to the filtration of the water, because we believed it was not then necessary. I cannot say why Dr. Voelcker was not called on that question, as I was not chairman at the time. I see no advantage to the corporation or to the company by the transfer of our works. If we sell our interest in them, we shall have to invest our money in some other way. We like to keep the works

in our own hands, and are opposing the bill simply because it seeks to confiscate our property.

Sir E. BECKETT: If it was proposed to take your property at an unfair price, I should say it was confiscation; but, if you are to have a fair price, I want to know what harm it will do you?

Witness: It is a hypothetical question.

Sir E. BECKETT: Well, take it so. Suppose you take it for granted that, if their lordships pass this bill, they will take care you have a fair price?

Witness: I do not know, I am sure.

Sir E. BECKETT: Supposing you get a fair price?

Witness: Upon whose judgment is the price to be fixed?

Sir E. BECKETT: I do not care upon whose judgment.

Witness: It is a very important matter.

Sir E. BECKETT: I am quite prepared to accept their lordships decision upon it. Perhaps you would prefer arbitration?

Witness: We prefer to keep our own property. We object to be compelled to transfer our securities. We believe we can do better with the works by retaining them in our own hands.

Sir E. BECKETT: But what is your real reason for opposing this bill, supposing their lordships take care you will get a fair price?

Witness: Nothing of the kind has been put before us. The bill proposes 23 years purchase.

Sir E. BECKETT: But did you not hear me say that that was put in because we were obliged to put in something?

Witness: We desire to keep the works in our own hands.

Mr. *Edward Cartwright*, maltster, Birmingham, stated he found the water supplied by the company to be of good quality, and well adapted for domestic and manufacturing purposes. He had a private well at his brewery, but it was found the company's water was superior for manufacturing purposes, it being harder than the well water.

Mr. *Grey*, manager of the water-works company, was examined as to the extent and efficiency of the works, and the steps intended to be taken to improve and extend the supply of water.

Mr. *G. Shaw*, professor of chemistry at Queen's College, Birmingham, and an ex-director of the company, said he had made frequent analyses of the water supplied by the company, and the results of the analyses submitted to the committee he believed to be truthful. They harmonized one with another as far as that was possible to do, and they confirmed the results obtained by himself. There could be no question that the company's water was of fair average quality. There had been exceedingly few complaints, and these had always been remedied to the satisfaction of the complainers. The company were ready to filter all their water. They had shrunk from no trouble or expense to provide a good supply of water for the town, and the result of their exertions had been to give the consumers confidence in them.

In cross-examination, witness said the reason the company increased their rates was that they had been put to large expenditure, and they were justified in recouping themselves. He could not understand why the ratepayers were desirous to see the works transferred to the corporation, except it was that they supposed the works would be very profitable to the town. For himself, he did not believe that it would be so.

(To be continued.)

Legal Intelligence.

WESTMINSTER POLICE COURT.—TUESDAY, JULY 27.

(Before Mr. ARNOLD.)

CHARGE OF STEALING GAS.

Mr. *George Sanderson*, proprietor of the Cadogan Hotel, Sloane Street, Chelsea, was charged on a warrant for that he did, on the 19th of July, 1870, and divers days subsequently, and on the 19th of July, 1875, feloniously steal 600,000 cubic feet of gas, the goods of the London Gaslight Company.

Mr. TICKELL, barrister, instructed by Mr. H. S. Brown, prosecuted; and Mr. CHILD (Bailey and Child, Sloane Street) defended.

Mr. TICKELL, in opening the case, characterized it as one of the most important investigations that could come before the court, not only on account of the position of the defendant, and the gravamen of the accusation, but on account of the amount of gas charged to have been stolen, and the manner in which it had been stolen.

Mr. ARNOLD asked if there were any case in point, and

Mr. TICKELL referred to the case of *The Queen* v. *Crips*. There were other cases, one at that very court eleven years ago, in which the gas was abstracted before it reached the meter, and conviction followed on indictment. The defendant in the present case was the proprietor of the Cadogan Hotel, a large establishment in Sloane Street, and irrespective of his own cellars, he rented one at the back of his house in the Pavilion Road, and running parallel with his own. In that cellar there was no meter, and the gas had no connexion with the regular meter supplied to the hotel, and in respect to the gas burned in that cellar the charge was made. The cellar had been in the occupation of a customer of the company, and on his giving up the use of gas, the company, as usual, took away the meter, and cut off the communication with the main, by affixing to the end of the inlet-pipe from the main a "cap," and the allegation of the prosecution was that that "cap" had been removed, and the defendant burned gas that he had never paid for. Gas being continually burned day and night in this cellar, the neighbours noticed it, and, on the 13th of July, Mr. Tully, the chief superintendent of the company, visited the premises of the defendant, and satisfied himself that there was no connexion of gas between this cellar and the others, and any gas burned in that cellar never passed through the meter. On the 19th of July he again visited the place, and took with him a number of the *employés* of the company, to keep observation on the cellar. He asked for the defendant, and, as he did not come, he went into the cellar and saw the cellarman; and, after being in conversation some time with him as to the supply of gas to the cellar, and receiving unsatisfactory answers, the defendant came down. Mr. Tully asked him whether there was any communication of gas between the cellar and the other cellars in his occupation. Defendant said there was a communication, but it was underground, and difficult to find. Defendant then took him to a coal-cellar, and there they remained some time. Just before this the cellarman of the defendant had been seen to enter the hotel with a screw-wrench, and one of the servants of the company keeping strict observation on the cellar, the cellarman was seen to apply this screw-wrench to the company's pipe; and, Mr. Tully being communicated with, all the company's people went to the cellar and saw that act. It was necessary to show that, when the gas was cut off, a "cap" was put on the service-pipe, only to be removed when the gas was resupplied, and only to be removed by a servant of the company, and with the sanction of the company. This cap had been removed from the pipe, and there was some india-rubber tubing attached to the pipe, which supplied five fishtail burners. The cellar was searched by the officers of the company, and, under dirt and cobwebs, they found the "cap," which had been there a long time; in fact, had evidently been there some years. Of course, they could only premise circumstances in connexion with the case from existing facts. Evidence would be given of the use of the gas continually for the time he had mentioned, and, with respect to the tubing, he should show that it was supplied to the defendant over four years and a half ago for horticultural purposes. Taking the lowest average of gas used during 12 months at this rate, it would be about 120,000 cubic feet, or 600,000, as laid in the warrant, for five years. The defendant had been using this gas all this time without the consent of the company; he must have known that it never passed through a meter, and therefore was not paid for. He should prove these facts, and then ask that the defendant be committed to take his trial.

Mr. CHILD said he had only just been instructed, and knew nothing of the facts; he wished for a remand.

Mr. TICKELL proposed to give the evidence of Mr. Tully and another witness now, and then ask for the remand.

Mr. CHILD said he would rather have the matter remanded at once; he apprehended the only question was one of bail.

Mr. ARNOLD asked the value of the gas.

Mr. BROWN said about £100.

Mr. ARNOLD said he would take two sureties in £100 each, and defendant in £200. Had the defendant bail present?

Mr. CHILD said he would become bail.

Mr. ARNOLD thought it very unusual; but he saw no objection if the prosecution had none.

Mr. TICKELL said they had none.

Mr. CHILD said the defendant was a gentleman of large property and position, and he should have a complete answer to this charge.

The required surety was then entered into, and the defendant left the court with his friends; the magistrate allowing a copy of the information to be furnished to the solicitor for the defendant.

Miscellaneous News.

ST. MARYLEBONE PUBLIC LIGHTING.

Report by Dr. Whitmore on the Quantity of Gas consumed by 24 Lamp-Governors taken from Street-Lamps in the Parish of St. Marylebone.

In order to determine with strict accuracy the amount of gas consumed per hour by a lamp-governor, the following apparatus is required:—1. A small experimental meter; 2. A minute clock; 3. Two King's pressure-gauges, one to show a high and the other a low pressure; 4. Two double dry governors; 5. A float fitted with three lamp-cocks; 6. A gasholder capable of containing 5 cubic feet of gas. All this apparatus, supplied by Mr. Sugg, the gas engineer, has been properly connected and temporarily fitted up in the court-house laboratory.

With regard to the lamp-governors, several of them were in a very defective condition, the bodies of some were battered in, and the burners of others dirty and corroded; they were supplied by three or four different gas engineers, but all of them, when made, were supposed to have been adjusted to consume 4 cubic feet of gas per hour under an inch of pressure; some two or three of them, however, in no respect acted as governors, inasmuch as under increased pressure they passed a proportionately increased quantity of gas, and showed that at the pressure ordinarily maintained between the hour of lighting and midnight—viz., 2 inches—their consumption was increased from 4 to 5 cubic feet per hour.

To render these experiments as reliable as possible, and to prevent any reasonable objections being taken to the results, separate testings of every governor were made under three different pressures—in all nine testings to each. The pressures employed were 1 inch, 1½ inch, and 2 inches, these constituting the range of pressure on the gases consumed in the parish during the lighting hours of the street-lamps. The results are given in Table I., and show that the mean or average amount of gas consumed per hour by each of the 24 governors, under an inch of pressure, was 4·03 cubic feet, under 1½ inch it was 4·35 cubic feet, and under 2 inches pressure 4·41 cubic feet. Under the lowest pressure 13 governors gave less than 4 feet, under the medium pressure five governors gave less than 4 feet, and under the highest pressure the number was also five. It is, however, proper to state that amongst the bad governors those which gave less than 4 feet were not greater in number than those which gave more; nine of them, under 2 inches of pressure, passed about 4½ cubic feet; two others passed over 5 feet, and two others over 6 feet, although with most of these the excessive consumption would not be apparent in the size and brightness of the flame as seen from the lamp, because of the corroded state of the burner and the necessarily imperfect combustion of the gas.

The action of these governors being so exceedingly irregular and varied, it was thought necessary, for the sake of comparison, to obtain results from perfectly new governors that had been properly tested, and on the accuracy of which reliance could be placed. For this purpose four new governors were obtained from Sugg's stock, and tested in a manner similar to those taken from the parish lamps, with this difference, that as they had been adjusted to consume 4 cubic feet of gas per hour at 6-10ths pressure, the two pressures used were 6-10ths of an inch and one inch. These results are given in Table II., and show a remarkable uniformity in the consumption of gas under both pressures, which may be taken as a satisfactory indication of the perfect action of these governors, and of their consuming, whilst kept in proper order, the full quantity of gas for which they are adjusted.

The next important point to determine, as one upon which there is great diversity of opinion, was the amount of decrease, if any, in the consumption of gas by a street-lamp to which a meter was attached. It was important, for this obvious reason, that if, owing to what is termed meter friction, the governor affixed to that particular lamp consumed less gas than eleven other lamps near it, the registered quantity consumed by such governor could not be taken as a fair average of the consumption by each of the others. To arrive at this knowledge, a new officially tested street-lamp meter was obtained from Mr. Sugg, through which the gas was made to flow to each of Mr. Sugg's governors under the same pressures that had been previously used. Table No. III. gives the result of these testings, in which it appears that under both pressures the reduction in the rate of consumption per hour was 0·09 of a cubic foot, equivalent to 2·12 per cent., a reduction very insignificant as applied to an hour's consumption by one lamp-governor, but amounting to something considerable when multiplied by all the lighting hours in the year, and further multiplied by all the lamps in the parish. Similar experiments were made with some of the best of the governors taken from the parish lamps, and with these the reduction was greater still. From these experiments, therefore, it would appear that, although the loss caused by meter friction is by no means so great as has been generally supposed, it is sufficient to show that the metered lamp does register a less quantity of gas than is actually burned by an unmetered lamp, and for that reason could not be considered as a strictly equitable estimate of the quantity consumed.

With regard to the alleged saving in the cost of gas to the parish of St. Pancras, as shown in the report of the chairman of the Lighting Committee, a reference to Table No. III. in that report will at once show the fallacy of attributing such saving to the adoption of the meter system. The saving effected in the two winter quarters, which is stated at £1465 6s. 10½d., is due partly to a reduction in the rate of consumption of gas from 5 to 4⅓ cubic feet per hour, and partly to a reduction in the time of burning the gas, amounting to 183 hours, all of which could have been accomplished without meters by an arrangement with the gas company.

The singular error of estimating the saving of the entire year by doubling the saving of the two winter quarters, as shown in Table VI. of the report, is such a palpable mistake that it seems hardly worthy of notice. It may, however, be worth while to state that, according to the Astronomical Tables, the number of hours between sunset and sunrise in the spring and summer quarters of the year

is 969 less than in the autumn and winter quarters, and it is therefore obvious that there will be a corresponding reduction in the saving of those quarters; that reduction, assuming that the consumption per burner per hour will be the same, and the number of lighting hours proportionately reduced, may be estimated to amount to £601 2s., which reduces the estimated saving in the year from £2930 13s. 9d. to £2329 11s. 9d.

The inferences to be drawn from the facts stated in this report are—First that no saving will be effected by the introduction of the meter system into the parish of St Marylebone; and, secondly, that more vigilant and systematic care and inspection by the vestry with regard to the lighting of the public lamps and the condition of the governor burners than are at present employed is imperatively needed. Every lamp-governor, before being fixed for a street-lamp, should be tested by a properly qualified official of the vestry, as well as by an officer of the gas company, and, if found correct, should be sealed to prevent its being subsequently tampered with. Weekly testings also should be made by the vestry's officer, of such a number of governors as will ensure all in use being tested at least once a year, and on a valid complaint being made by any ratepayer of a deficiency of light from any number of street-lamps in the parish, the governors of those should be at once tested, and, if found faulty, replaced by proper ones.

As regards any reduction in the amount at present paid to the gas companies for the public lighting of the parish, the only way in which it appears possible is by decreasing the number of lighting hours during the spring and summer quarters. This may be done to the extent of an hour and a half, or possibly two hours, per day, by the adoption of a properly graduated scale, which increases the interval of lighting after sunset and extinguishing before sunrise in the ratios of the increasing length of day, and decreases in the same manner. Assuming the decrease to be two hours per day during the 26 weeks, the saving effected will be about £900; or if an hour and a half, three-fourths of that amount.

J. WHITMORE, M.D.,
Medical Officer of Health and Gas Examiner to the Parish of St. Marylebone.

Court-House, July 10, 1875.

TABLE I.—*Showing the Consumption of Gas per Hour by* 24 *Lamp-Governors, taken from Street-Lamps in the Parish, under Three Different Degrees of Pressure—viz.,* 1 *Inch Pressure,* 1½ *Inch Pressure, and* 2 *Inches Pressure—each Governor, when made, having been adjusted to consume* 4 *Cubic Feet of Gas per Hour, at an Initial Pressure of* 1 *Inch.*

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.
1 in. Pressure—																								
First reading .	4·15	4·45	3·35	4·25	4·85	5·25	3·75	3·90	3·90	3·90	3·85	3·85	4·25	3·10	3·10	4·20	3·50	4·45	3·15	4·20	3·40	4·00	5·90	5·00
Second reading	4·10	4·45	3·40	4·15	4·80	5·20	3·75	3·90	3·95	3·83	3·80	3·85	4·10	3·10	3·10	4·10	3·45	4·40	3·05	4·15	3·40	3·90	5·80	4·90
Third reading.	4·05	4·40	3·40	4·15	4·75	5·15	3·80	3·80	3·95	3·75	3·65	3·80	4·15	3·15	2·95	4·10	3·45	4·40	3·05	4·20	3·45	3·95	5·80	4·85
Means . .	4·10	4·42	3·38	4·18	4·80	5·20	3·77	3·87	3·93	3·83	3·77	3·83	4·17	3·11	3·05	4·13	3·47	4·41	3·08	4·18	3·42	3·95	5·83	4·91
1½ in. Pressure—																								
First reading .	4·10	4·70	4·10	4·45	5·05	6·10	4·25	4·35	4·50	4·25	4·30	4·95	4·20	3·45	3·25	4·70	3·45	4·60	3·00	4·35	3·45	4·10	6·50	5·05
Second reading	4·15	4·70	4·10	4·35	5·05	5·95	4·25	4·25	4·40	4·15	4·35	4·95	4·15	3·50	3·00	4·65	3·45	4·55	3·05	4·35	3·45	3·95	6·50	5·00
Third reading.	3·95	4·70	4·00	4·30	4·95	5·90	4·15	4·30	4·40	4·10	4·20	4·95	4·15	3·55	3·00	4·60	3·45	4·50	3·25	4·35	3·45	4·05	6·50	4·90
Means . .	4·07	4·70	4·06	4·37	5·01	5·98	4·22	4·38	4·43	4·17	4·28	4·95	4·17	3·50	3·08	4·65	3·45	4·55	3·10	4·35	3·45	4·03	6·50	4·98
2 in. Pressure—																								
First reading .	3·95	4·75	4·70	4·30	5·00	6·00	4·40	4·50	4·45	4·10	4·60	6·10	4·35	3·65	3·05	4·65	3·30	4·55	3·05	4·50	3·45	4·10	6·90	4·65
Second reading	3·90	4·80	4·70	4·35	5·05	5·90	4·35	4·40	4·40	4·10	4·40	6·15	4·20	3·75	2·95	4·55	3·50	4·50	2·90	4·45	3·45	4·05	6·75	4·45
Third reading.	3·85	4·80	4·70	4·15	5·00	5·70	4·20	4·45	4·35	4·20	4·45	6·15	4·10	3·65	3·00	4·60	3·45	4·40	2·95	4·40	3·35	4·05	6·90	4·45
Means . .	3·90	4·77	4·70	4·27	5·02	5·87	4·32	4·45	4·40	4·13	4·48	6·13	4·12	3·68	3·00	4·60	3·42	4·48	2·95	4·45	3·42	4·06	6·85	4·52

Mean of all the readings under 1 inch pressure . . . . . 4·03
Ditto ditto 1½ inch ,, ... 4·35
Ditto ditto 2 inches ,, ... 4·41
Ditto ditto the three pressures . . . . . 4·26

TABLE II.

Consumption of Gas by Four of Sugg's New Lamp-Governors, adjusted to Burn 4 *cubic feet of Gas per Hour, at an Initial Pressure of* 6-10*ths of an Inch.*

No. of Governor.	Six-Tenths of an Inch Pressure. Mean of Three Testings in Cub. Ft.	No. of Governor.	One Inch Pressure. Mean of Three Testings in Cub. Ft.
1	4·18	1	4·23
2	4·08	2	4·22
3	4·14	3	4·24
4	4·18	4	4·26
Mean of all the testings	4·14	Mean of all the testings	4·24

TABLE III.

Rate of Consumption by the above Lamp-Governors after passing the Gas through a Street-Lamp Meter.

No. of Governor.	Six-Tenths of an Inch Pressure. Mean of Three Testings in Cub. Ft.	No. of Governor.	One-Inch Pressure. Mean of Three Testings in Cub. Ft.
1	4·05	1	4·21
2	4·03	2	4·16
3	4·18	3	4·20
4	3·95	4	4·03
Mean of all the testings	4·05	Mean of all the testings	4·15

CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

The Half-Yearly Meeting of Shareholders was held on Friday last, the Rev. Dr. PHELPS, Master of Sidney Sussex College, in the chair.

The following report of the directors was submitted:—

The directors, in submitting to the shareholders a statement of accounts for the half year ending Midsummer, 1875, state that the profit and loss account shows a balance of £2850 8s. 2d. in favour of the company. Out of this sum the directors recommend a dividend after the rate of 10 per cent. per annum on the consolidated stock, and after the rate of 7 per cent. per annum on the amount paid up on the new shares, payable on or after the 2nd day of August, free of income-tax.

This will leave a balance of £650 16s. 2d. With £468 of this it is proposed to pay to the shareholders 1 per cent., free of income-tax, on both old and new shares, in order to partly compensate for the great deficiency of dividend paid for the half year ending Midsummer, 1873. A surplus of £182 16s. 2d. will then be available for costs relating to the rating of the company's property, and other legal expenses. The directors have, on the recommendation of Mr. Hawksley, entered into a contract with Messrs. Cutler and Sons, for the construction of a new telescopic holder, to replace the present one (which is entirely worn out), at a cost of £4000, as well as a new lime purifier, and other works. The greater portion of the cost of these works will be payable out of revenue, but the payments will be spread over several half years. The proportion of the cost of the new works chargeable to capital will be raised by a call upon the holders of the new shares, and notice of the call will be given in due course.

The directors have much pleasure in being able to present to the shareholders so favourable an account of the company's operations, and hope that with coals, as now, at a more reasonable price, good dividends may continue to be earned.

In conclusion, the directors trust that the state of the company's affairs, as now shown, may be satisfactory to the shareholders.

The report of the manager, Mr. Weeks, stated that the works and plant generally have been maintained to meet a steady, although not rapid, increase in the production and sale of gas and residual products. The construction of the new gasholder, lime purifier, and other works, is progressing, and, he had every reason to hope, will be ready for the ensuing season. The illuminating power, purity, and pressure of the gas had been well kept up to the required standard, and, he trusted, had been satisfactory to the public.

The CHAIRMAN, in moving the adoption of the report, said: Gentlemen, the report of the directors, which is in your hands, would, I conceive, justify me were I simply to move its adoption, and congratulate you on the state of our affairs as therein exhibited. For, thanks to the reduced price of coals, we are again earning our maximum dividends. But the fact is, there never was a more critical period for the interests of gas companies than the present, and never were more powerful and dangerous enemies arrayed against those interests than are to be found in the promoters and supporters of the Gas Regulations Bill which has recently been before Parliament, and which, indeed, is still on the order-book, and will be discussed in committee, if time can be found for it this session. And, although this bill has direct and immediate relation only to the metropolitan companies, yet it is impossible that the principles which it involves can be admitted by Parliament without injuriously affecting gas property throughout the country. I cannot, therefore, although I am not a shareholder in any one of those companies, sit quietly down without asking you to join with me in a protest against that which, if carried in any one of the forms which have been proposed, will, in my opinion, amount to a breach of faith on the part of that great council of the nation, of which we all desire to be proud. I proved to you on a former occasion, and the validity of my argument has been admitted by a great many highly competent judges, and has been contravened by none—I proved to you that Parliament, by most elaborate and repeated Acts of legislation, did virtually, and I think very properly, in the interest of the public, induce the formation of companies all over the country, with large capitals, for the manufacture and sale of gas, in the full assurance that, with prudent management, the profits, though limited by statute, would be 10 per cent. on capital of one class, 7 per cent. on that of another class, and so on. What I mean to say—and I have proved it by reference to the Gas Acts—is this: that the statutory terms framed by Parliament in those Acts would bear no other interpretation, but that Parliament intended to adjust all the *variables* of the problem of gas legislation then known or supposed to be known, in such a manner as to render those rates of profit as good as guaranteed. I pointed out that if certain other conditions which have since supervened had then been known, it is impossible to believe that they would have interfered with or altered the plain intention of Parliament. The terms of the adjustment might have been somewhat different, but the result would have been the same—the same assurance would have been implied—the same security would have been inferred and would have been intended to be inferred. Well, gentlemen, I still maintain that in regard to the various capital sums raised under that implied assurance, any new statutory conditions, sliding scales or other devices, nullifying or even enfeebling or modifying that assurance, would constitue a distinct breach of faith. Parliament would be in its right in imposing any conditions whatever in regard to new capital to be subscribed, or to new undertakings. But the capital already invested in gas-works, up to a certain time, under a great variety of circumstances, was undoubtedly advanced in reliance on the implied effects of the original conditions. And I have no hesitation in asserting that to change those conditions now, so as, under any contingency, however rare, to make it impossible for the companies to realize those rates of profit, would be an act of repudiation quite out of character with the general commercial legislation of this great country. That this would be the effect of the legislation suggested by the promoters of the bill to which I am referring, there can be no doubt. In plain terms, what they desire is this: they desire to have it enacted that if the cost of production should at any time—by no fault of the companies—be so enhanced that the price of gas must be raised above a given prescribed limit, in order that the profits which were sanctioned by statute may be possible, then those very profits shall no longer be deemed allowable. Such an enactment would really mean that the consumers of gas shall be protected against the natural consequences of whatsoever enormous increase may take place in all the elements of gas manufacture. It means, I say, that a particular class, because large and powerful, shall be specially protected against certain natural consequences. And how? Why, by arbitrarily insisting that the disastrous effect shall be vicariously suffered by another class, because smaller and less powerful—viz., the manufacturers. That is to say, by those who, whatever the cost, and with no option of withdrawing their capital and otherwise employing it, are bound not merely to supply the article, but to supply it in a prescribed state of perfection, under heavy penalties for every defect, whether of quantity or of quality. Now this, I maintain, is, to all intents and purposes, tantamount to the repudiation of a contract. For there was virtually a contract, and that contract was made in the belief, and with the intention, that all probable—nay, all possible—contingencies had been considered. If, therefore, a new contingency has arisen in the form of an undreamt-of and unprecedented enhancement of the cost of production, it is quite clear that a revision of the statute is necessary; but it is more than clear that the repudiation of a principle which was so adopted by Parliament as to induce extensive and irrevocable monetary transactions, is inconsistent with the honour of that august assembly. I need not repeat the arguments of my former speech, which was printed and widely circulated. I showed that the capital of these companies had virtually—in consequence of the action of the Legislature in regard to them, and of the public reliance on the honour of Parliament—acquired the character almost of a guaranteed stock. People of all classes purchase them at prices which yield them simply a fair rate of

interest. Such an enactment as I have described would reduce their saleable value at least 30 or 40 per cent. I ask you—I ask the public generally—would that be a sample of commercial legislation calculated to maintain the dignity and honour of the nation as represented by Parliament? It is not a question of party politics, it is a question of common honesty. I would therefore express a wish that gas companies in general should make common cause with the metropolitan companies, lift up their voices in protests against legislation so unjust, and give every possible demonstration of sympathy with the determined resistance which has been offered by those companies, and which certainly so retarded the bill, that there was no chance of its passing this session. The Chancellor of the Exchequer, indeed, some months ago, was understood to say that unless the 6th clause of the bill were omitted, the Government would not support it, because that clause implied a breach of faith on the part of Parliament towards the gas companies. I sincerely hope this principle will be adhered to whenever the attempt is resumed. I am not presuming to speak on this subject, gentlemen, as a commercial man, but simply as a man of education, both general and scientific, who has looked carefully into this subject, and who, as an Englisbman, is truly jealous of the honour of the great council of the nation. And I declare to you, that quite irrespective of the trumpery pecuniary interest which I possess in this company, I should learn with pain and humiliation that Parliament had been induced to commit so gross an act of repudiation as to alter in any way the conditions of profit on which the earlier capital sums were allured, for the public service, into gas manufacture. I now beg leave to move that the report of the directors be received and adopted.

Mr. S. PEED seconded the adoption of the report, and thanked the chairman for his able speech.

Mr. BOND, whilst bearing testimony to the zeal of the chairman and directors, took exception to some of the remarks made by Dr. Phelps as to the implied guarantee of 10 per cent. dividends, and did not think the House of Commons would forget itself in any point of honour.

Mr. FETCH replied to the remarks of the last speakers, and applauded the speech of the chairman, the language of which was not a bit too strong. He also thought the shareholders were much indebted to the chairman and directors for the manner in which they had managed the affairs of the company.

Mr. GIFFORD also spoke warmly in support of the chairman's speech.

The report was then adopted; and it was further agreed, upon the motion of Mr. GIFFORD, that the speech of the chairman be printed and circulated according to the discretion of the directors.

The dividends recommended in the report were declared, and the retiring directors and auditor were reappointed.

Mr. S. PEED submitted a motion to rescind the resolution concerning the annuity paid to Mr. Gifford, passed at an ordinary half-yearly meeting of shareholders on Jan. 29, 1874, and to authorize the payment of the arrears of such annuity.

The motion was seconded by Mr. ATKIN, cordially supported by the CHAIRMAN, and unanimously adopted.

A vote of thanks to the chairman closed the proceedings.

LAMBETH WATER-WORKS COMPANY.

On Tuesday, the 27th ult., the Shareholders of this Company accepted an invitation from the directors to pay a visit of inspection to the company's works at Ditton, and the new reservoirs and works at West Molesey. The weather being remarkably fine, and the directors having made admirable arrangements for the reception and entertainment of their guests, a very pleasant day was spent in the excursion, and every one must have been amply satisfied by seeing the judicious manner in which the capital rendered necessary by the rapidly increasing business of the company has been expended.

The visitors after leaving the Surbiton Station of the South-Western Railway, proceeded to the Ditton works and inspected the filter-beds, engines, &c., there. They then embarked on board the old civic barge, the *Maria Wood*, in which vessel they were towed up to the Molesey reservoir, and Mr. J. Taylor, chief engineer, gave an interesting explanation of the various works which have been recently carried out by the company. On the return journey an excellent luncheon, over which the chairman of the company (Mr. Bouverie) presided, was served in the saloon. The usual loyal toasts of course followed, and a number of complimentary toasts were also proposed and responded to.

The following information respecting the history and progress of the company's operations, which has been supplied to the shareholders, cannot fail to prove interesting to a much larger circle of readers. It appears that the Lambeth Water Company was the first of the London companies whose intake was removed above Teddington Lock, beyond the tidal influence of the river Thames; this work being accomplished in 1851 by the opening of the new works at Ditton. For many years these works satisfied the requirements of the times, but the rapid extension of the company's district of supply rendered it necessary, about the year 1865, to increase the filtering power and other parts of the works, and for this purpose three subsiding reservoirs and additional filters were added to the Ditton works.

In 1868 a Royal Commission was appointed to inquire into the general question of water supply to London, and one of the results of the report which appeared in 1869 was, that more marked attention was drawn to the quality of the water and to the desirability of improved filtration. One of the chief difficulties the company had to contend with up to this period, as regarded the filtration, was the turbid water discharged by the river Mole during floods. This river joins the Thames on the Surrey side opposite to Hampton Court Palace, about two miles above the Ditton works, and flows down the same side and past the works, without mingling to any great extent with the rest of the river water, exhibiting the curious spectacle of a band of turbid water some 20 feet wide traversing the side of the river, otherwise more or less bright and clear. The consequence at that time was, that during the floods the turbid water of the Mole was necessarily received into the filters, while the clear water from the upper part of the river flowed past the works. To remedy this state of things the company, on the advice of their engineer, went to Parliament, and obtained an Act in 1871 to construct a conduit from the Ditton works to a point at West Molesey, nearly four miles higher up the river and above Molesey Lock, and to take in the supply of water at that place. The works for accomplishing this were begun in September, 1871, and opened in August, 1872; since that time the water for the entire district has almost uninterruptedly been taken from the new source, and considerable improvement been thereby effected in the filtration during the floods. After this work was finished it was found necessary to increase the very limited filtering area at Ditton, to meet the constantly increasing demand for water in the company's district, and as this could only be done by converting the small subsiding reservoirs there into filters, which would then leave the company without any reservoirs whatever, it was decided to construct simultaneously with the filters at Ditton, the storeage reservoirs at Molesey, which were contemplated and authorized in a general way by the Act of 1871. All these works have now been perfected. The Molesey reservoirs were begun in April, 1873, and were so far finished in November last as to be of considerable service to the company during the winter, but owing to the magnitude of the works they have only lately been completed so as henceforth to fulfil the intentions of their design.

The land purchased by the company being intersected obliquely by the conduit for conveying the water to Ditton, the reservoirs, two in number, are necessarily of unequal size, the smaller having an area of about 4 acres, and the larger an area of about 25 acres; and both being 16 feet in depth, will contain together, when full, 126 million gallons of water. The high waterline of the reservoirs is 12 feet 6 inches above the ordinary summer level of the river at Molesey, and consequently they have to be filled by steam-engine power. For this purpose two 50-horse engines, with suitable pumps, are erected, which are capable of lifting into the reservoirs 24 million gallons of water per day.

The object in view in constructing these large reservoirs is to store the river water, when in its best condition, for use when it becomes more or less turbid from heavy rains. Storeage also improves the purity of the water by allowing time for suspended matter to subside, and thus assists the process of filtration.

The present total quantity of water consumed in the company's district approaches 13 million gallons per day; but the summer demand being much in excess of the winter, the daily averege per year is at present about 13 million gallons only. Thus, when full, the reservoirs contain about ten days supply; and by selecting the times of pumping, so as to replenish them when the flood water of the river is in its best condition, it is anticipated that 20 to 30 days of such a period will easily be tided over with little perceptible deterioration in the colour of the water; and this will be more readily understood when it is explained that by an arrangement of the inlet and outlet pipes, the water is put in at one end and drawn out at the other end of the reservoirs, thus allowing several days for subsidence from the time of its entry during its slow progress to the point of outlet.

The water on leaving the reservoirs passes through the conduit before mentioned by gravitation to the Ditton works, where it is filtered and pumped for use in the district. The engine power for this purpose at Ditton is at present about 900 horse, but, with two engines in course of erection, will, in a few weeks, be 1200-horse power. The present power of 900 horse is constantly at work, night and day, pumping the water through two main-pipes, each 10½ miles in length, to the company's filtered water store reservoirs at Brixton. From thence a little more than half the quantity goes to supply the lower district of Lambeth, Kennington, Newington, &c., while the remaining quantity, which has now reached 7 million gallons a day, is again pumped by engines of collectively 400-horse power from Brixton to the more elevated reservoirs at Streatham, Selburst, and Rock Hill, near the Crystal Palace, from which the vast suburban district surrounding these points is supplied.

From this brief sketch the extent of the company's property will be generally comprehended, and when it is mentioned that the water requirements of the district were only about 2 million gallons a day in 1840, rising to 7 million gallons a day in 1864, and now approaching 15 million gallons a day (thus becoming of double the extent in 11 years), the necessity for the large works above described, and the magnitude of the company's operations, will be readily understood.

The capital of the company authorized by Acts of Parliament is £1,250,000, and the amount actually paid up is £968,950. In 1840 there were only 80 shareholders in the company, and at that time their gross rental was but £18,203. In 1852 the number of shareholders had increased to 214, and the gross rental to £29,005. At the present time there are 730 shareholders, and the gross rental is £122,235.

From the returns made to the Local Government Board, it seems that of the total volume of water which may be supplied daily by the company—viz., 20 million gallons—the average daily supply during the month of June last was 14,528,100 gallons. The number of houses, &c., supplied was 52,387, and the number of houses on constant service, 3000. The estimated population supplied within the district of the company is 366,709. The company have 500 miles of mains, of which 450 miles are in the metropolitan area. The number of miles of streets in which the mains of the company are constantly charged within the metropolis is 90.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

(*Continued from page* 156.)

Mr. A. MACPHERSON (Kirkcaldy) read the following paper:—

ON THE RELATIONS WHICH EXIST BETWEEN THE DURABILITY AND BROMINE TESTS AND THE ILLUMINATING POWER OF GAS AS EXPRESSED IN STANDARD CANDLES.

Having occasionally heard a wish expressed for a paper on this subject, and as I see it inserted in the list of subjects issued for this year by the committee of this association, I have resolved to put before this meeting the tables you here see suspended, and to offer a few observations on the subject; not with a view to instruct, but rather to tempt a discussion, and, if possible, thereby to elicit the views of the members on this matter, which I feel to be one of considerable importance. Without, therefore, any further introduction, I would observe that the relations which exist between these three methods of estimating the value of gas as an illuminating agent are, I am convinced, from careful consideration and experiment, very close indeed; and, moreover, I am also convinced that, wherever you have accurately ascertained either of the three, there is little difficulty in arriving, by the methods I have adopted, and which I am about to explain to you, at either of the other two. Or, where you have the per centage of hydrocarbons absorbed by bromine, or the durability of one cubic foot of the gas by a 5-inch flame given, it is easy to determine the illuminating power as expressed in standard candles.

Before entering into a comparison of the results of my investigations into this subject, I would remark that the relation which exists between the durability of a gas and its illuminating power, as expressed in standard sperm candles, is an accidental one; and so also, in the same way, the relation which exists between the per centage of hydrocarbons contained in a gas and the illuminating power, as expressed in standard candles, is likewise accidental, for the following reason—that the illuminating power, as thus expressed, has no direct reference to the composition of the gas, as a gas, any further than it is an established and recognized standard of comparison, by which the value of different gases as illuminating agents may be determined and expressed in a uniformly recognized standard, for the sake of such comparison. For, whereas at present, the value of the standard candle is fixed at 120 grains of sperm per hour, what is to prevent it from being altered now, or at any time, by Act of Parliament or otherwise, to 100 or 140 grains per hour; and, if such an alteration was made, of course the relation, which I will endeavour to show at present exists, between the durability of a gas and its illuminating power, as expressed in candles of the present standard, would no longer be applicable, and hence my reason for the assertion that the relation is accidental. On the other hand, the relation which exists between the durability of a gas and the per centage of hydrocarbons contained in it is absolute and unalterable. And so, in proportion to the amount of hydrocarbons present in a gas, will its durability and illuminating power be. These are thus controlled by the composition of the gas, and, as the laws which regulate these relations cannot be altered as the candle standard can, so I have termed the one relation accidental, and the other absolute or unalterable.

It is a well-known fact that the greater the specific gravity of coal gas, provided it is free from carbonic acid, the greater will be its durability and illuminating power, and as the specific gravity fluctuates according to the presence of a large or small proportion of hydrocarbons, it is evident a direct relation must exist between them and the illuminating power and durability of a gas.

With these explanatory remarks, I will now proceed with my endeavour to demonstrate to you what I consider to be the relation which exists between the durability of a gas and the illuminating power as at present expressed in standard candles.

If you will look at table No. 1, you will there see the method I adopt to ascertain the illuminating power in candles where the durability by a 5-inch flame is given. You will also observe the table is divided into two halves; the upper

half, you will notice, shows only gases whose illuminating power exceeds or is equal to 30 candles, and whose durabilities range from 60 to 80 minutes, and the under half shows gases whose illuminating power exceeds, or is equal to, 20 candles, but under 30 candles, and whose durabilities range from 40 to 60 minutes. Well, let us now look at the upper half of the table, and examine the method I have here illustrated, and the results obtained by this method, and compare these with the results obtained by the photometer. I may here observe that I have purposely refrained from tabulating the results of my own experiments, and have rather chosen to select those of other analysts from published analyses sheets, so that I might be free from the charge of being under the influence which almost invariably affects one who has got a theory in his head, and who wishes to confirm such by experiment.

No. 1.

Name of Coal.	Durability by 5-inch Flame, in Minutes and Seconds.		—	Illuminating Power as thus got.	Illuminating Power as got by Photometer.	Analyst.
	Min.	Sec.		Candls.	Candles.	
Lochore	68	0	÷ 2·0	34·00	34·10	Mr. Cusiter.
Ditto	66	20	,,	33·10	33·00	Ditto
Wemyss	62	36	,,	31·18	31·75	Ditto
Lesmahagow "Wee"	60	30	,,	30·15	30·50	Ditto
Airdriehill	65	5	,,	32·52	32·60	Ditto
Orchard	68	0	,,	34·00	33·52	Dr. Wallace.
Auchinheath "Wee"	64	0	,,	32·00	32·36	Ditto
Wemyss	65	40	,,	32·70	32·52	Mr. G. Hislop.
Haywood	62	14	,,	31·07	30·55	Ditto
Belladyke	76	20	,,	38·10	38·63	Ditto
Allanton	47	28	÷ 2·1	22·50	22·32	Ditto
Camp, S. and P.	42	10	,,	20·05	20·40	Ditto
Bank Coal	57	0	,,	27·14	27·07	Dr. Macadam.
Lochgelly	48	20	,,	22·95	23·61	Ditto
Dunnikier	50	0	,,	23·80	23·16	Mr. Tatlock.
Woodside	52	0	,,	24·76	24·89	Wallace, Tatlock, & Clark.
Ashgill	51	13	,,	24·34	24·00	Mr. Cusiter.
Blackhall	53	30	,,	25·38	25·30	Ditto

You will observe I have here in the first column the name of the coal from which the gas was produced; in the second, the durability as given in analysis, which, in this case, I divide by two; and in the next column you have the illuminating power as thus ascertained. In the next you will find the illuminating power as found by the photometer; and if you compare the two, I am persuaded you will agree with me in saying the results are very nearly alike, so much so, that in glancing over the table you will be willing to admit they are near enough at least for all practical purposes.

Let us now look at the lower half of this table, where we have gases whose durability is under 60 minutes, and in this case you will observe that a slight change is necessary, and that instead of dividing the durabilities in this case by two to arrive at the illuminating power, I find it necessary to divide by 2·1, and with a like satisfactory result. Satisfactory, I term it, for if you carefully examine the whole table, you will find only one or two instances in which the difference between the results obtained by the two different methods is slightly in excess of half a candle.

If, then, I am correct in supposing that this is the relation in which they stand to each other—and I am convinced it is a pretty safe and correct method of estimating the illuminating power, where there is no photometer, and, where there is a photometer, of checking the results obtained by it—if, I say, this method is correct, it would appear that gases whose durability fall below 60 minutes are of 1-20th less value in illuminating power, in proportion than gases whose durability ranges from 60 to 80 minutes; and hence the necessity of dividing by 2·1 for the lower range, and not by 2, as for the higher range, or, as I would suppose, by 1·9 for a durability of over 80 minutes—that is to to say, that, between the two points 60 to 80, a diminution of value to the extent of 1-20th of the candle power is experienced—and, in like manner, between the two points 40 and 60, a like diminution takes place. Although, when we are dealing with such high numbers as these, this 1-20th does not, to any great or sensible degree, affect the results obtained by the method I have explained of dividing by 2 and 2·1, still it is well to note that such is the case, as further on I shall, when endeavouring to establish a relation between the per centage of hydrocarbons absorbed by bromine and the durability and the value in standard candles, require to take this into account.

It would, therefore, appear, roughly speaking, that every two minutes of durability is equivalent to one candle, where the durability is from 60 to 80 minutes, and where it is from 40 to 60 minutes, every two minutes is equivalent to one candle, minus 1-20th; or where the durability is from 80 to 100 minutes, every two minutes will represent one candle, with 1-20th added. This latter I am unable to illustrate to you, but such, however, is the opinion which my investigations into the subject have caused me to form.

I will now proceed to the second part of the subject, and endeavour to explain the manner in which I have attempted to establish a relation between the per centage of hydrocarbons contained in a gas, as found by these being absorbed by bromine in the usual manner by the Cooper tube, and the durability and value in standard candles. In the first place I would remark that here I take 20 per cent. absorption to represent 80 minutes of durability, and 15 per cent. to represent 60 minutes, these being four times removed from each other. In fact, I mean to assume that every 1 per cent. of hydrocarbons absorbed represents four minutes of durability, with the depreciation four times magnified added, 20 per cent. being taken as the exact point of equality, and on this assumption I will endeavour to construct a rule by which the illuminating power in standard candles can be ascertained where the amount of hydrocarbons absorbed is known. Now, let us look at table No. 2, and I will try to explain how I mean to do so. I have already said I assume 15 per cent. to represent 60 minutes, and 20 per cent. to represent 80 minutes; and, as we find a diminution in value to the extent of 1-20th of the candle power between these two points, and as I assume 80 to be the point from which the depreciation will gradually increase as the durability falls, until it reaches 60 minutes, when it can no longer be neglected, but must be taken into account in the next stage by adding to the divisor, so now we cannot afford to neglect even the 1-20th, as we are now dealing with numbers four times less, and, consequently, this diminution will be magnified four times, which, unless taken into account, would, in this instance, be a source of considerable error. If you will now look at the table, I will explain how I intend to take this into account. As I take 20 per cent. and 80 minutes to represent the exact points of equality, and that as you depart from these numbers you gradually lose the true balance, but from which you may depart within certain limits without any material error being observed, but beyond which limits allowance must be made for such departure, here, then, we have 20 per cent. representing equality, and 15 per cent. representing 60 minutes, with a depreciation of 1-20th four times magnified, which, I consider, would now be correctly represented by 4-20ths, and which I have apportioned in the following manner:—As 20 is the point of equality, I make no allowance from 19 to 20, as I consider no error of any magnitude will be likely to occur so near the start-point. I then allow 1-20th from 18 to 19 per cent., 2-20ths from 17 to 18 per cent., 3-20ths from 16 to 17 per cent., and 4-20ths from 15 to 16 per cent., the greatest allowance being made to the numbers farthest from the point of equality. Now let us take 10 to 15 per cent., and in the same way let them represent 40 and 60 minutes, and, as we have seen that between these two points 1-20th more of the value is lost, we must add another 1-20th to the 4-20ths, which will equal 5-20ths to be divided over the numbers from 10 to 15 per cent., and for simplicity I have apportioned them thus—14 to 15 per cent., 5-20ths; 13 to 14 per cent., 6-20ths; 12 to 13 per cent., 7-20ths; 11 to 12 per cent., 8-20ths; 10 to 11 per cent., 9-20ths.

If you will now give me your attention for a little, I will show you how I intend to apply this arrangement. In the first column of this table we again have the name of the coal; in the second column, the per centage of hydrocarbons absorbed is given. As I said, I meant every one per cent. of absorption to represent 4 minutes durability, and having divided the durability by 2 and 2·1, to arrive at the value in standard candles, I now multiply the per centage of hydrocarbons by 2, and add, as at 15 per cent., 4-20ths to that amount to arrive at the same result; but you will observe, 4-20ths should only be added for the lowest point of this range, and as the absorption is 15·2, I deduct 2-10ths, or 1-5th of 1-20th from the amount, which leaves 33·29 candles as the illuminating power, being, as you will observe, a very near approach to that given in the analysis, 33 candles, and also to that obtained by the division of the durability, 33·10 candles. In the same way I go over all the others, adding the proper number of 20ths, according to the amount of absorption.

No. 2.

Name of Coal.	Hydrocarbons absorbed by Bromine.	—	Illuminating Power as thus got.	Illuminating Power as got by Photometer.	Analyst.
	Per Cnt.		Candls.	Candles.	
Lesmahagow	17·0	$\times 2\frac{3}{20}$	35·70	34·80	Mr. Cusiter.
Lochore	16·5	$\times 2\frac{1}{20} - \frac{1}{5}$ of $\frac{1}{20}$	35·00	34·10	Ditto
Ditto	15·2	$\times 2\frac{1}{20} - \frac{1}{5}$ of $\frac{1}{20}$	33·29	33·00	Ditto
Ditto, second and third	14·0	$\times 2\frac{1}{20}$	31·50	31·08	Ditto
Wemyss	14·0	$\times 2\frac{1}{20}$	31·50	31·75	Ditto
Lesmahagow "Wee"	13·2	$\times 2\frac{1}{20} - \frac{1}{5}$ of $\frac{1}{20}$	30·23	30·50	Ditto
Lochore, second	12·8	$\times 2\frac{1}{20} - \frac{1}{5}$ of $\frac{1}{20}$	29·57	30·00	Ditto
Camp, half S. and P.	8·0	$\times 2\frac{1}{20}$	20·40	20·40	Mr. G. Hislop.

If you examine this table you will see that the results obtained are almost, if not equally, satisfactory to those obtained by the other process. No doubt they are not identical with those stated in the analysis as ascertained by the photometer, but still near enough, I think you will admit, to justify me in asserting that, with all points carefully and accurately worked out, the results would be by the three different methods almost, if not exactly, identical. Nor can we wonder at some slight differences, when we consider the numerous facilities for error which exist, and into which the analyst may unconsciously fall. Let us for one minute look at and enumerate some of these; and, taking first the photometer, what facilities for error does it offer? We have the water-line of the meter, the reading of the index, the weighing of the candle, the accuracy of the watch or minute clock, the temperature of the gas, the difference of the vision of the different operators when judging of the equality of the light on the two sides of the disc, and last, but not least, the burner used to consume the gas—is it always the one most suitable for each particular quality of gas? I am afraid not, and, in my opinion, a burner suitable for certain qualities should be fixed on, and after you ascertain the quality by the durability, use the burner suitable for that quality; and in this way I have no doubt a nearer approach to uniform results will be obtained. Then in the durability test we have again the water-line, the watch or clock, the height of the flame, and the temperature of the gas, which should be the same for both tests, and, in fact, for all the tests, and where such is not the case, the results should be carefully corrected to the standard, or else how can we enter into comparisons with any hope of uniformity? Then in the bromine test we have again the temperature, which in this case offers repeated facilities for error, as, for instance, the original temperature may not be maintained throughout the entire experiment, through not allowing the tube to remain long enough in the equalizing cylinder after each agitation, or, as in none but in Mr. Cusiter's analysis do I observe that it is distinctly stated that the purified gas is tested for carbonic acid, it is possible some operators may dispense with this very necessary operation, and considering that the CO_2 has been entirely removed by the purifier, fall into error by having any CO_2 present absorbed by the potassa added to remove the bromine vapours, and consequently an undue per centage of hydrocarbons would be noted. Or, again, sufficient potassa may not be added to completely reabsorb the bromine vapour, and which, being held in tension by the gas, too small an amount of absorption may be noted; or if the thumb is not held so firmly on the end of the Cooper tube as is necessary, a small portion of air may be admitted, or a like portion of gas be allowed to escape, all or any of which would vitiate the whole experiment, and so render comparisons in the way I propose utterly useless.

Of course, all these sources of error are well known and, as far as possible, avoided by the experienced analyst; but, nevertheless, the most experienced may inadvertently fall into them occasionally, and however minute these errors may be, still, when we come to have to multiply or divide, they may then come to assume proportions sufficient to thwart our best efforts for uniformity.

I might also be permitted to draw your attention to another matter—that is, the different results which we sometimes see given by different analysts of the same coal, and in illustration of this, I would ask your attention to the following example, and I trust the gentlemen whose names I will mention as analysts in connexion with this, will not be offended, as I can assure them they are not made in any unfriendly spirit, but merely, as I have said, to illustrate this want of uniformity, and, if possible, secure this to a greater extent in future. I have, amongst others in my possession, an analysis sheet of Haywood coal, in which I find an analysis by Mr. G. R. Hislop, and side by side with it two of the same coal by Dr. Macadam. Mr. Hislop gives the illuminating power of the gas he obtained from that coal as 30·55 candles, and the durability by 5-inch flame as 62 minutes 14 seconds; while in one experiment the doctor gives the illuminating power as 34·87 candles, and the durability as 61 minutes, in his other experiment the doctor has an illuminating power of 30·97 candles, with a durability of 58 minutes. Here we have, side by side, a wide difference, for, while the doctor has only a durability of 61 minutes from 34·87-candle gas, Mr. Hislop gets 1 minute 14 seconds longer out of a gas of 4·32 candles less value. Now, either there must be an error with one or other analyst, or both, or there is no relation between durability and photogenic power, or no relation, as far as durability is concerned, between one cubic foot and another of the same gas; for, by the doctor's second experiment, he got a gas with an illuminating power of 30·97 candles, or only ·42 higher than the illuminating power of the gas as given by Mr. Hislop; but, although so near to each other in illuminating power, Dr. Macadam only had a durability of 58 minutes, while Mr. Hislop had a durability of 62 minutes 14 seconds, or 4 minutes 14 seconds longer from a gas ·42 candle poorer. And what is more striking still is that, while Dr. Macadam got only 61 minutes from 34·97-candle gas, by his second experiment he got 58 minutes from a gas of four candles less value, or, a fall in the photogenic power of four candles only affected the durability to the extent of three

minutes. Tested by the methods I have explained to you to-day, Mr. Hislop would appear to be correct, and, in explanation, I would suggest that Dr. Macadam has made a mistake of 10 minutes; for, if we divide 71 minutes by 2, we get 35·5, and multiply the hydrocarbons absorbed, 16 per cent., by 2 3-20ths, we get 34·4, and by the photometer the illuminating power was found to be 34·87, thus coming in midway between the two, a difference which may be caused by error so small as to be almost insensible. You have thus an example of how the methods I have been speaking of to you to-day may be used to check the results obtained by either process.

I also noticed an analysis by another analyst, where the per centago of hydrocarbons absorbed is given at 6·3, and the illuminating power of that gas is said to be 23·11 candles; and we have here camp coal, with an absorption of 8 per cent., and an illuminating power of 20·4 candles. Now, some of these must be wrong, or there can be no relation between the illuminating power and the amount of hydrocarbons (the luminiferous ingredients) contained in it; but camp, by both my methods, works out, and proves itself to be correct, which, if we prove the illuminating power of the other by method No. 2, it will not do; but prove it by the durability, 49 minutes 7 seconds, divided by 2·1, you get 23·6 candles, and by the photometer it was found to be 23·11 candles, clearly showing an error was committed in the bromine test. Most likely the whole of the bromine vapour had not been removed, or the temperature not equalized.

You will observe I have, in all my tables, drawn largely from the analyses of our late lamented friend, Mr. Cuaiter, and I must say I have found these to correspond exceedingly well with the theories I have put forward to-day. Whether this may be owing to accident, or some other cause, I will not attempt to say; but this, at least, I will say—it shows a most remarkable uniformity in the manner he has conducted his experiments, and, considering his high reputation as an analyst, I am prepared to say I think it is due to the care he bestowed on his operations.

In conclusion I would remark that, before we can hope for an accurate analysis, a great deal more care must be given to it than is customary at present. I now beg to thank you for the patient hearing you have given me, and to express the hope that, if the remarks I have made should be considered in themselves of little or no value, they will, at least, awaken an interest in this important and interesting subject, and induce some one more competent than I am to take up and deal with it, and to fully discuss and elucidate it.

The PRESIDENT: I am very much pleased with the way in which Mr. Macpherson has brought this matter before us. He has referred to an analysis of mine, and I should explain that a statement of the kind he desiderated is quite unnecessary, because, were I to find any trace of carbonic acid in the purified gas, I would condemn the experiment, because 1 per cent. carbonic acid will reduce the illuminating power of gas 6 per cent.

Mr. B. M. M'CRAE (Dundee) read the following paper on

A WORD TO GAS MANAGERS, WITH SPECIAL REFERENCE TO THE NECESSITY FOR IMPROVEMENT IN THE USE OF GAS.

At the request of our secretary, I am to read to you a short and hurriedly got-up paper, being a word to gas managers, with special reference to the necessity for improvement in the use of gas. We live in an age of improvement—an age of professed, if not real, economy—an age in which, if we do not advance in knowledge, and that at a pretty quick pace, we shall soon be left far behind, and allowed to spend the remainder of our days in undisturbed drowsiness. Gas managers, as a rule, may be said to have kept pace with the speedy growth and development of the business in which they are engaged, although not yet an old business.

When we look at the history of gas lighting from its small beginning some 60 years ago, and think of the magnitude at which it has now arrived—of the continual changes and improvements that have taken and are taking place in the manufacture and distribution of light, of the immense number of persons who use it, and the importance of gas as an illuminating agent, it is not to be wondered at that there exists so much ignorance and, perhaps, more carelessness in the use of gas as it ought to be used.

I am not here to-day to say that managers of gas-works are all—nay, nor is one—yet arrived at what may be termed perfection in his profession. Far from it. But this I believe, that, as a rule, managers of gas-works have arrived at much greater perfection in the manufacturing and distribution of gas than their customers have in the using of the gas. Why this is so it would be difficult to say. Perhaps one chief reason is that gas consumers generally are very much left to themselves to do just as they choose in the matter. They may occasionally be assisted by their gas-fitter; but my experience has been that, speaking generally, gas-fitters seem to be as ignorant of the principles of gas lighting, as it ought to be, as any of their customers can be. I do not blame them, for in these days of cheapness, the gas-fitter is screwed down to the last thread in his charges, and occasionally a little farther. It is no wonder that he does not study the principles of his trade, and takes little care in the execution of his work. Gas managers, it may be said, ought to educate the people in this important matter. Yes, they ought; but will the people be educated by them? Happily, where the gas-works belong to the people themselves, this may be done; but where the gas-works belong to a dividend-paying company, the likelihood is that, should the gas manager begin to advise the consumers as to the best mode of using the gas, the consumers would suspect that such advice was for the purpose of increasing the profits of the company, and, consequently, would not listen to his good advice. This being so, perhaps it is not too much to say that gas managers have not always done what they might have done in this direction. I feel sure that many, if not all present, have had many opportunities of doing much in teaching consumers of gas how to improve the light in their premises without adding to the quantity of gas consumed. I think no opportunity should be lost in helping our customers to help themselves. By doing so we shall ultimately help our business, by bringing it more and more into favour.

I will now endeavour, as simply and as plainly as I can, to mention a few simple rules, which, if attended to, will do much to improve the light, and not at more, but often at less cost than what at present prevails. All the interior fittings of every factory, shop, dwelling, or other building should be of such dimension as will permit the gas, when every burner is in use, to flow easily to each burner. If it were made a law that no pipe could be placed in any building unless of a diameter in proportion to the maximum quantity of gas that would be required to pass through it, a great public benefit would be the result. Just fancy a house fitted with ⅜-inch or ½-inch tubing—no part larger—where there are, say, 20 burners to be supplied, and the next-door neighbour has his house fitted with ¾-inch, ½-inch, and ⅜-inch, with perhaps a less number of burners. Both services are from the same main; but the one consumer is continually complaining of bad gas, and the other pays you a compliment on the fine gas you are giving.

I come now to the burner. This is so very important that I must be a little minute in what I say thereon. It matters little what is the quality of the gas you supply, or the size of your main or service pipes, or of the interior fittings; if there are bad burners used, or burners unsuitable for the quality of the gas supplied, all will be wrong and unsatisfactory. When I say that the burner must be one suitable for the gas used, this means that in different towns different burners may be required; and it means this also, that in each town the quality of the gas should be maintained at as uniform a standard as possible. It would be vain in me to attempt to lay down a rule whereby consumers of gas could be guided, because those who suffer from a supply of over 30-candle gas would require almost to be chemists ere they could be expected to use gas of that quality as it ought to be used. It is comforting, however, to know that there are not many, if any, who suffer such an infliction; or if there are any—and I believe there are not many, in Scotland, at least, who require to use 18-candle gas—those who have to submit to that quality would require a very different training how to use their gas properly than what would be generally applicable to Scotland. Again I may say it is comforting to know that there are not many, if any, who suffer such an infliction. I will suppose that the gas supplied in Scotland is within the range of between 24 and 28 candle power; while I admit that a burner suitable for 24-candle gas would not, all else being equal, be suitable for 28-candle gas, still that which would be very suitable for the one would not be very unsuitable for the other.

What, then, is the burner? and what are the arrangements for the proper use of such gas? I am not disposed to give a description of every burner that exists, nor especially of those burners which are, by those who offer them for sale, said to give 50 per cent. more light at half the cost for gas. These and all such great lights are too far advanced for me. I must not go beyond the limits of my experience; therefore I will stand fast by the union burner as the best. I think that we have been so far in error, however, in using these burners of too small outlets, and using too much pressure.

Those who heard Dr. Wallace's lecture at our last meeting, or those who have read it, if they have done what they should have done, they will have discovered that small burners cannot give results at all equal to large ones; that is to say, you require a certain amount of light, you have a burner of a given size, you must have a pressure of gas to a given extent to obtain the light you need; yet you get it, but at much greater expense than it ought to be. Take a burner with much larger openings, and use it with much less pressure of gas, you will get equal light with much less gas; or you will get much more light from an equal expenditure of gas. I might now enter into an explanation of the laws of combustion, stating what has been stated thousands of times, how that gas of a given quality requires a given quantity of oxygen to burn it properly; for plain, practical purposes, it always seems to me to be shooting over the heads of the persons you wish to instruct. Every one cannot be expected to know that 100 parts of the atmosphere are composed of 77 of nitrogen and 23 of oxygen, and that nitrogen is a non-supporter of combustion, nor are they supposed to know that oxygen is the most energetic supporter of combustion. To say to them, if there were no oxygen there would be no flame, would all be quite true, but to very many of them would be talking nonsense.

Gentlemen, in some of our papers we have, I fear, been trying to appear much learned, rather than earnestly endeavouring to instruct others who have not had the opportunities of acquiring the requisite knowledge in the department strictly our own. How, then, is the gas to be maintained at a uniform pressure, so that all the lights in a town shall at all times have just the requisite pressure? Always bear in mind that though there may be proper interior fittings, and proper burners used, if there is much variation of the pressure, very much, if not all, of the benefit to be gained under proper circumstances would be lost. The gas manager at most of the gas-works can do something to regulate the flow of gas—so far, to suit the demand at the various hours during which gaslight is required—by proper attention to the governor, but he can only do this partially. No gas manager can be aware when this house or that may be lighted up, or the gas shut down, each of which has an influence on the pressure of gas, quite beyond the control of any manager. No doubt where there are factories, mills, workshops, and places of business which generally have a fixed hour of closing, the pressure at such hours can be, and is—so far as possible—regulated at the works; still the evil exists in spite of all this. I cannot help here expressing my surprise that there should be one gas-work in the kingdom without a governor to regulate the pressure in the manner just stated; yet, there are many works which have not this, nor any other appliance. This should not be so; no gas company, no gas manager, should rest satisfied until that useful appliance is fixed in every gas-work.

I have said that the governor at the gas-works only partially equalizes the pressure, what, then, is required further? The answer is easy; every consumer of gas who desires to have the best light at the least cost ought to have a governor, or what is more properly termed in this position, a regulator; no public lamp nor private consumer of gas but should have one of these excellent economizers attached to the gas supply. Again, I must repeat that useful as the regulator is, its real benefit can only be obtained when all the other principles have been attended to—viz., sufficiently large pipes, and proper burners used. Very frequently regulators are fitted in a house and no benefit accrues therefrom, just because the other arrangements are in an improper condition. Gentlemen, this to my mind is of so much importance, that it is our imperative duty to help to an improvement in the use of gas. It is no trifle when we know that a large majority of gas consumers lose at least 25 per cent. of the light they ought to have from the quantity of gas they use. In other words, consumers of gas, as a rule, ought to have 25 per cent. more light from the quantity of gas they use, or an equal light from a proportionately less quantity of gas.

The necessity for improvement in the direction indicated is not only right and proper as we are now circumstanced, but when we anticipate that at a very early date we Scotch people will require to use an inferior quality of cannel coal, in consequence of the superior qualities getting used up, this means that the quality of the gas must of necessity be reduced in illuminating power; if by an improved use of such gas an equal amount of light can be obtained as is now enjoyed, surely it would be well-spent labour to get consumers of gas to adopt these means of improvement.

Gentlemen, I might have given you long tables, showing the various results obtained by various burners with the same gas, and by the same burners with different qualities of gas, and used at various pressures. Had I done so you might have found that these did not harmonize with your preconceived opinions, and consequently would very likely have thrown my figures aside, and remained as you were. To my young friends in the profession, I would say that you will find it a pleasant and profitable occupation to make tests for yourselves; you will like them better because they are your own. Knowledge gained by experience is of much more value than that gained from the pen of another.

Mr. KEY: Mr. M'Crae's paper is more of the nature of an address, and I think it is a very valuable one. It is my opinion that some remarks would have been made upon it had it not been regarded as of the nature of an address.

Mr. NELSON: It is very refreshing to hear a paper of this nature, particularly with reference to the class of burner which should be used. Any one placed as I am must be very much tortured by the various patent burners which are submitted to our notice, and it is very refreshing to hear a man with such experience as Mr. M'Crae possesses recommending the old union jet burner. There is no denying the fact that the union jet burner will be found the best in use, if it is replaced sufficiently often. I am not speaking of street lamps, but for household purposes.

Mr. PEEBLES: This is a subject which is continually cropping up at meetings of this nature. It is a very valuable point in connexion with the whole subject of gas manufacture—the point of production and the point of combustion. In Paris it has lately been gone into very thoroughly, and an office has been instituted at which the public may obtain instruction relative to the various kinds of burners, and all appliances used for the distribution of gas are placed in the hands of very competent persons, and the people are invited to go and examine the results for themselves. I think Mr. M'Crae's paper evidently points to the conclusion that, sooner or later, this important subject will be forced upon all engineers and managers of works. Seeing the utter ignorance of the public, and the utter ignorance of those who have entrusted to them the important duty of fitting up houses and factories with gas, I think it cannot fail to become the imperative duty of gas managers to give instructions as to the method in which the fitting should proceed, the selection of burners, &c. I was

consulted lately about the fitting up of a large factory in the west of Scotland, where the gas is of high illuminating power. I advised that pipes should be put in fitted for 15 candles, instead of 28 candles, because, although the cost would be greater at first, it would be less afterwards. I think the subject of pressure is one which will be brought more and more before the profession, not only as regards the combustion of gas at the burners, but in connexion with the leakage in the mains.

The PRESIDENT: This has been a very interesting subject, and it is one with which, in the main, I quite agree. With regard to the desirability of looking after the gas to the point of combustion, I think there can be but one opinion. It is very extraordinary to think of the amount of gas which is wasted by imperfect means of combustion. Unquestionably, Mr. M'Crae is right when he says it often happens that it is a question of burners which makes the difference between satisfaction and dissatisfaction. We find ourselves often congratulated by people, while other persons, using the same gas, pronounce it abominable—it gives too much smoke, it does not give enough light, or something else. These defects in many cases might be remedied by suiting the burner to the quality of gas supplied. For some time I have caused my inspectors of meters to carry burners with them to sell to consumers, an arrangement not made with a view to profit. It is well known to the consumers that they could not procure the same burners at twice the money they pay for them. In this way I am getting a kind of burner introduced which is best suited for the kind of gas I make. There is great room for improvement in this direction, and it would be well that the members should give their attention to the matter, and see what improvement on the present state of things can be effected.

Mr. A. MACPHERSON afterwards read the following paper

ON THE CONSTRUCTION OF CONCRETE TANKS FOR GASHOLDERS.

As the construction of gasholder-tanks in concrete is a subject in which most gas engineers, at present, feel a considerable interest, and as I have myself taken considerable interest in it, and have also had some small experience in the construction of one, I have assumed it would not be altogether uninteresting to you should I offer you a few remarks regarding it. In the first place I may say that, after the full and exhaustive manner in which this subject has been treated by Mr. Douglas, of Portsea, there is no necessity for, and I have no intention of going over the whole of the ground so ably traversed by him, but will confine myself to a few practical remarks, more especially in reference to one which I have successfully constructed for Mr. Carey, of West Wemyss, and in which I have been able to solve a point which was considered by some as doubtful—viz., could a concrete tank be constructed, and made perfectly water-tight, without the use of puddle?

Last year I was waited upon by Mr. Carey, and requested by him to prepare plans and specifications for a tank and gasholder sufficient to supply the village and castle with gas; and he, along with myself, being a believer in concrete, we agreed the tank should be constructed of it, I, at the same time, agreeing to guarantee him a water-tight tank without the use of puddle. He agreed to allow me to try it, on my taking the responsibility, and I am glad to say we have had no cause to rue our hardihood in attempting, for the first time, to dispense with that (in the eyes of some) all-sufficient material, puddle. I may also state that my plans and specifications were out, and the work commenced, before I had the pleasure of seeing Mr. Douglas's paper, and, in fact, before it was read to the British Association.

The tank I constructed at West Wemyss was a small one, but of sufficient size for the purpose it was required for, and, at the same time, to test the efficacy of concrete, pure and simple, as a material for the construction of tanks, and as a substitute for brickwork and puddle, the size being 37 feet diameter by 14½ feet deep, inside measure. The manner in which we proceeded was, after the excavation was completed, a course of concrete, 9 inches thick, was laid all round as a foundation on which to rear the walls of tank, this course projecting 9 inches, both outside and inside of walls. In the inside the edge was left very rough and irregular, so as to afford good joining to the bottom. On this foundation course the walls were reared, and carried upwards for 7 feet of the thickness of 2 feet, from which point to the top they were 18 inches in thickness, surmounted by a cope formed of two of sharp sand to one of cement. This cope was run on the top of the concrete walls by a mould and trainer, and projected inwards 1½ inch from face of wall, and, being a true circle, it gave the tank a nice true finished look; not that such was required, as the circle was carefully maintained on the walls all the way up, the trainer being applied whenever a mould was changed, and it was carefully adjusted to the true circle before any concrete was put into it.

The bottom of the tank was covered with a layer of concrete, 12 inches thick, carefully joined to scarcement, or footings of walls, and the whole work, both walls and bottom, was carefully covered with a coating of pure cement, from three-eighths to half an inch in thickness, and, when thus finished, I must say it was a splendid looking dish, with not a seam or joint visible, and, in my opinion, very much superior to brickwork. The concrete employed was composed of five parts gravel and one part Portland cement, proportions which I am now convinced might have, with all safety, been reduced to seven parts of gravel to one part of Portland cement. The gravel used was obtained from the sea beach, and was of the size of from about 3 to 4 inches diameter downwards to the size of peas, and of all shapes. I mix no sand amongst it, as I consider this has a tendency to weaken the concrete, and it will go quite close enough with an aggregate of the sizes I have mentioned to give sufficient stability, and it is on the inside coating the whole of the dependence must be placed for rendering it water-tight. With concrete of the proportions used, the thickness of the walls might have been reduced with perfect safety to 1 foot 4 inches at the bottom, and to, say, 10 inches at the top; and even with concrete of the proportions seven to one a tank of the size mentioned might with impunity be trusted at 21 inches at the bottom, reduced to 12 inches at the top.

The moulds used were of wood, the ribs forming circles were cut out of planks, and closely lined on the face with lining in narrow breadths the short way. And, although this was found, with a little attention, to suit very well, still a tendency to twist was experienced, and in future I would use iron moulds in preference to wood. The back and front moulds were kept in their position by bolts going through the walls, on the top of which the lower ones rested; but this we latterly dispensed with, and secured the back mould by rances from the side of the excavation, and the face mould by similar rances from the uprights of scaffolds. This we found more convenient and easier to work, besides doing away with the bolt-holes through the wall, and the necessity of filling these in, and which, if neglected or forgot, might cause trouble.

The concrete was prepared in the usual manner. We had a bottomless box, with a mark all round indicating one-sixth of its capacity. This was laid on the preparing platform, and five-sixths of its capacity filled with gravel, the remaining sixth with cement. The box was then removed, and the whole turned over with iron drags and shovels and well mixed, then turned back again to secure thorough incorporation, after which water was gently added in the proportion of six gallons of water per cwt. of cement, if the gravel was dry, and five gallons if the gravel was wet, and again turned and well mixed, after which it was introduced into the moulds, and gently rammed.

The concrete should not be thrown from too great a height, as, by so doing, you are apt to separate the cement from the aggregate; and, for the same reason, much ramming is objectionable, and where this is persisted in, and the concrete thereby worked into a very soft condition, the cement will leave the aggregate, and rise to the top, the consequence being to weaken the work generally, and to get a thin layer extra strong at the cost of the other portions of the work.

On the top of each layer, and at each joining on end, I had pretty good-sized angular stones inserted before the concrete set, and also caused the top of each layer, if there was any tendency to smoothness, to be brushed with a stout, stumpy birch besom, so as to roughen the surface, and secure a good rough bed for the next layer, and, in changing the moulds from one course to another, I had band broken at the joinings so that the joining of one course was not immediately below the other. Care should also be observed in mixing the concrete not to add too much water, or the strength will be considerably reduced, and I have found that, where too much water has been added, the concrete is permanently weakened, and even if more cement is added to bring it to the proper consistency, it is never so strong as when properly prepared at first. I may also add that it is a matter of no importance whether fresh or salt water is used for mixing, but carefully avoid water having clay in it, and also see that no clay or loamy matter is mixed with the aggregate used. It is also advisable to wash the top of each course well with water before putting on the next, so as to remove any clay or loamy matter which may have accidentally got there, and at the same time to damp the previous work.

I am of the same opinion as Mr. Douglas regarding the use of iron. This I consider utterly useless; at least with a concrete tank without any puddle, as, should the work be so weak as to yield to the pressure, and a rupture take place, the iron might assist to hold it together, but still the tank would leak; but as it is the engineer's duty, in constructing iron or brick tanks, to see that the foundations and the thickness of plates or walls are sufficient to secure the proper amount of stability and resistance to pressure, so also it is his duty to see in concrete tanks that they are also constructed of the proper strength. For my own part I would trust more to concrete than to brick and cement, although the latter was one quarter greater in thickness; and I am sure if you will examine the block of concrete which I have brought to show you, and which is composed of five parts gravel and one part cement, you will at once be convinced that concrete, where in any way fairly treated, and a due regard paid to the proper thickness of walls, may be trusted to resist more than ordinary pressure.

I had also a small tank, with walls and bottom of 2½ inches in thickness, constructed of six parts gravel to one part cement, which I intended to have shown you here to-day, but misfortune befell it. In order to test what pressure it would stand, I had bolts inserted and brought above the surface one inch; I fitted a malleable iron cover with connexion for water-pipe on top, and to this I put a connexion to water-main, and attached one of King and Co.'s check gauges to ascertain the pressure it would stand, and on turning on the pressure it was found to remain entire and water-tight at 15 lbs. per square inch for some time, but when the pressure was slightly increased it split, and, strange to say, at the very place where I had inserted hoop-iron all round to secure the heads of bolts. Whether this was owing to any action of the iron, or to the fact that the workman, in securing the cover, had drawn the bolts so tight as to cause a rupture, I cannot say; but the latter I suspect, as I am certain it should have stood far more pressure. It is also right to mention the tank was only made one month ago, and was not, therefore, nearly at its full strength, considering cement requires 12 months, or longer, to reach anything like its full strength.

In the tank constructed at Wemyss during last summer, wherever openings were required, pieces of wood tapered were inserted, and, after the concrete was sufficiently set to admit thereof, these were withdrawn, so as to prevent the wood from becoming fixed by swelling, owing to the absorption of water from the concrete. For the holding-down bolts of columns, zinc tubes of such a diameter as allowed of the bolts being freely moved were inserted, the tubes being set perfectly plumb over the openings in cotter plates, and, after the bolts were in and the columns screwed down, they were run up with grout.

One point I would desire specially to caution you on is that, whereas it is generally supposed frost does no injury to cement work, I am convinced it does; and, if any of you should construct a concrete tank, take care that frost does not get at the inside coating until it is thoroughly dry, or you will find it to become loose and fall off wherever the frost has got at it. I have seen a coating of half an inch in thickness come clean off where frost had got at it before it was dry; not certainly in cement work of a tank, but in other concrete work, and where it was put on by experienced workmen.

In conclusion, I would urge upon you the necessity of selecting a good cement, which you can generally tell by the colour, which should be a light bluish-grey. The cement used at Wemyss was Brooks's, and it was found to be of excellent quality, and has proved itself to be so by the satisfactory job we have got of the tank, in which we had our difficulties, having an old pit-mouth and a mine, standing full of water, to contend with in the bottom; but, notwithstanding, it is water-tight, and, when I inquired a few days ago at Mr. Carey's about it, he wrote—"A shower of rain makes it run over; it is a most successful structure in difficult circumstances." I may, therefore, claim to have been the first engineer to construct a tank of concrete pure and simple, without any brickwork to strengthen it (which I look upon as so much humbug), and without any puddle to aid it, and to make it perfectly water-tight. I must, however, observe great care is necessary in the conduct of the work, if it is to be successful, and the contractor or foreman should take a lively interest in its success, and thereby induce extra care; and, if such is the case, there is no fear of failure.

Mr. M'CRAE: Mr. Macpherson omitted to tell us the cost per cubic yard or cubic foot.

Mr. MACPHERSON: Comparing it with brickwork, even using five to one—which was not necessary—I consider I saved 20 per cent. The saving would be increased if we had used seven to one.

Mr. SMITH: Would 12 months have to elapse before water could be admitted into the tank?

Mr. MACPHERSON: No; two or three months. The concrete will harden after the water is admitted; but it will take about 12 months before the full strength of the work is attained.

Mr. SMITH: The reason why I ask about the relative price is this: we have just built a tank 132 feet in diameter, and we found we could do it cheaper with brick and puddle than with concrete.

Mr. MACPHERSON: That would depend upon whether the brick was laid in lime or cement.

Mr. SMITH: My calculations were to use hydraulic lime.

Mr. MACPHERSON: That is a different thing.

Mr. SMITH: Could you tell me what the cost would be per cubic yard for a tank such as that at West Wemyss, in stone, and in brick and cement?

Mr. MACPHERSON: For the concrete the price would be 25s. or 26s. With brick the price would be 32s., 33s., or 34s., and the whole of the puddle extra. I never built a stone tank.

The PRESIDENT: I am sure great credit is due to Mr. Macpherson for bringing this subject before us. We were not aware that he was engaged in constructing a concrete tank when Mr. Douglas, of Portsea, reported on the subject. We are, therefore, proud that Mr. Macpherson has taken the initiative in this affair, which is of great importance, as I indicated in my address to you, to secure a perfectly tight tank was matter of solicitude, apart altogether from the question of cost. Now we have not only accomplished what we wanted, but at a greatly reduced cost. There is no doubt, therefore, that the construction of tanks in concrete will receive very special consideration at the hands of those who have such work to do in the future.

The PRESIDENT here called upon Mr. Key to exhibit and explain his model of a station governor.

Mr. KEY said: My object in constructing this governor was to obviate the

liability of accident by our ordinary governors. I had a slight accident in my gas-works, by which the office was destroyed, and the whole of the books burned. It was caused by a slight escape from a jet which had accumulated in the governor-house. When the pressure was put on on a Christmas morning, the gas exploded. The crown of the governor was formed of twelve plates made of tin, and it was blown to pieces. There were two governors in the room, the largest one 15 inches, and the gas was blown direct from the holder. The escape from the 15-inch pipe was very alarming, and there was no means by which the communication could be stopped, except by putting the town in darkness. We had a force-pump, but it would not work so as to seal the outlet from the holder. I was therefore driven to construct a governor by means of which, in the event of any accident occurring, no serious gas escape could take place. I have arranged this by having a cone inside the dome, quite detached from the regular governor bell. If an accident were to happen, the bell is regulated by the town pressure, and there could be no greater escape of gas than what would pass through a ¾-inch tube. All you have to do is to shut off the the cock. [Mr. Key then showed the working of his patent, which gave great satisfaction.]

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The same dreary story has again to be repeated. There is no animation in the iron trade proper, nothing but sluggish languor and very dark forebodings as to the immediate future of the trade. Few firms are doing anything in merchant irons, either bars, sheets, hoops, or plates, and with the exceptions of a few lots of Low Moor and Bowling for special constructive or engineering work, I hear of no sales worth noting during the week. Low Moor bars are £22 per ton, as heretofore, and are not likely to be changed in price at present. The other good Yorkshire irons are firm, although few of the brands are in even moderate request. The medium qualities of bars and sheets are not inquired after, and common kinds are simply neglected, despite the desperate underselling which is now being resorted to as a means of attracting purchasers.

Pig irons are sympathetically weaker. Certain classes of Hematite pig iron used in the production of Bessemer steel have gone down as much as 10s. to 12s. 6d. per ton, and all ordinary brands are 2s. to 3s. easier. The agents of Cleveland firms now quote at about these figures:—No. 1 foundry, 49s.; No. 2 foundry, 52s.; No. 3 foundry, 49s. to 50s.; No. 4 foundry, 48s.; No. 4 forge, grey, 47s.; No. 5 forge, mottled, 47s.; No. 6 forge, white, 46s.; refined metal, 67s.; Kentledge, 55s.; and cinder pigs, 40s. per ton. It is thought that these prices are about as low as it is possible to make pig iron at, and it is consequently proposed to limit the output until the requirements of the market generally are equal to the production. That this will not be an accomplished fact for some time henceforward is very evident, when the great depression in the rail and finished iron branches is taken into consideration.

The coal trade continues not only quiet, but positively bad. The house coal department is always expected to the dull, with limited sales, during the hot months; but there is generally a fair demand for manufacturing purposes, even in the summer. Now, however, everybody in or connected with the coal trade declares that the situation is desperate. Sales cannot be effected; competition is keener than ever, and is growing; and stocks have a distinct tendency to accumulate, even although the miners only work three days weekly.

Under these circumstances, it is by no means surprising to find that the coal-owners are discussing the question of attempting to make a further reduction in the miners wages. They met at Sheffield on Monday, and talked the matter over, but separated without coming to any decision on the matter.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

There is little alteration in the condition of the iron trade of this district since last report. Quotations for branded iron continue firm on the basis of £10 per ton for bars, and makers are doing a moderate business. Producers of the commoner qualities of finished iron are generally fairly well engaged, though the competition for orders is rather keen, and prices are consequently very irregular. The principal demand is for sheets, hoops, bars, and angles, chiefly for local consumption, the hardware trades being just now unusually buoyant. Sheets are freely offered at £10 15s. per ton, and bars at £8 per ton. Australia and New Zealand continue to be good customers for galvanized roofing sheets, and for the leading descriptions of builders ironmongery.

In pig iron the market is moderately steady, though the business reported is of small extent. Foundry iron is mostly in demand. Quotations are:—For native all-mine hot-blast, £4 5s. per ton; cold-blast ditto, £6 per ton; and cinder pig, £2 17s. 6d. to £3 per ton. The leading ironfoundere continue well employed on the heavier classes of produce. Quotations for gas-mains vary from £6 to £6 15s. per ton for 6-inch, the prices for other sizes being in the usual proportion to those rates. Considerable activity is displayed at the gasholder yards in the West Bromwich district. Mr. Daniel Howard has just completed a 60-feet single-lift vessel for the Cannock Gaslight Company, and has several important ones now in course of construction.

The coal trade rules dull, and prices have a downward tendency. As a rule the collieries throughout the district are not at work more than half time, while many of the pits in the Wolverhampton district are altogether idle. Forge coal of good medium quality is freely offered at 7s. 6d. per ton at the pits, and fine slack is almost unsaleable. A trial shaft has been commenced by the recently formed Hamstead Colliery Company, and great confidence is felt in the ultimate success of the undertaking.

THE COAL AND IRON TRADES OF LANCASHIRE.

(FROM OUR OWN CORRESPONDENT.)

The coal trade, in all its branches, continues very quiet, and stocks are increasing. In the Manchester market the house coal trade is extremely dull, and for other classes of coal there is but little inquiry. Although the leading colliery proprietors are still maintaining late rates for delivery in the immediate district, they are being undersold in the open market, and prices are quite as irregular as they were before the late reduction.

As I anticipated in a previous report, the dispute in the cotton trade in the Oldham and Ashton districts has led to the closing of the mills, and a protracted strike seems probable. This has caused a very depressed feeling in the coal trade of the above district, as the cotton trade is a very large consumer of the engine classes of fuel, and stocks at the collieries are already heavy.

In the West Lancashire district everything continues very quiet, and, although prices are not materially lower, they are weak and irregular. The pits continue working short time, and it is not improbable that a still further restriction of the output will be necessary if colliery proprietors wish to avoid an accumulation of stocks. In many cases, they are now confining themselves to raising just what is sufficient to cover their very limited requirements.

There are still a few inquiries for gas coal in the Wigan district, and some of the orders which have been held back are being placed; but there is no great amount of business doing. In the Manchester district this branch of business is now practically over for the season, as most of the gas coal raised in the neighbourhood has been placed.

The coke trade is quiet, and prices are weaker generally. In the Manchester market there is a little easier tone, but no general reduction has been made.

There is no improvement in the iron trade, and although very low prices are now being quoted, little or no business is induced. Consumers seem convinced that the lowest point has not yet been reached, and they are only prepared to do business on terms very considerably under the present current rates. The few orders that have been placed during the past week have been placed at extremely low rates, in some cases 4s. per ton under the quoted price. Nominally, prices are about the same as those last given; but quotations are at present of little or no value.

The position of works remains without much material change; they are generally very short of orders.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The gas coal trade of the North of England keeps remarkably dull. There is a falling off of shipments at the Tyne Dock, and the second-class pits are very poorly employed. It was stated by the Mayor of Tynemouth, who is an extensive iron steam-ship owner, when the question of a reduction of the price of gas came before the Town Council of that town on Friday, "that extensive contracts had been made by gas companies for gas coals at a stroke under 8s. per ton." There is a considerable quantity of gas coal on offer in the market at a figure ranging from 8s. to 8s. 6d. per ton; but, of course, the first-class collieries ask, and probably get, a higher price than that. The trade, however, is very open at present, and so long as the iron manufacturing trade of the North of England remains in its present depressed condition, there is not likely to be much change in that particular. The household coal trade has shown a slight improvement, though without any change in prices. There is a little better coasting inquiry, and orders continue to come into the market; but there is not much reason to fear a rush. The shipments of steam coals are tolerably good. A number of small vessels loaded up steam coals last week for some of the ports in the Channel, and likewise for the Baltic. Manufacturing coals are becoming of less value, and a good deal of small coal is being added to stock.

There was a tolerable arrival of coasting vessels in the Tyne and Wear last week. They were in request, and, in some instances, there is an advance of 5s. per keel on freight. The following are some of the quotations:—Penzance, 7s. 6d., and Poole, 7s. per ton; Plymouth, £7 10s. per keel. For the Irish ports, Waterford and Dublin, £8 15s to £9 per keel; Limerick, £11 per keel. To the Dutch ports, £7 10s. to £8 per keel. 6s. 6d. per ton was paid to sailing vessels to discharge coal at the wharves in London river.

The Cleveland iron trade is particularly slack; No. 3 Cleveland pig can be bought as low as 49s. per ton. Manufacturers are short of work, and there are few inquiries for rails. Foundry business is dull. The chemical trade of the Tyne has been rather quiet this week, though in the last two days a little more business was done, and prices were a trifle firmer. The timber trade is a little better, though, at the same time, prices are low. More cargoes are brought to market, and there is a stronger disposition to transact business. There are few fire-bricks for shipment to London at present.

The general trade of the North of England is extremely quiet. There seems a want of confidence. Merchants are timid, and, if anything, the tone of trade last week on Newcastle Quayside was a little more depressed than it was upon the previous week.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

On Thursday week, the gaslight company of Cullen, Banffshire, held their annual meeting, when the secretary submitted an account of the company's transactions for the year ending July 1, 1875, which was found satisfactory. In the directors report, which was submitted, it was recommended that a dividend of 5 per cent. be paid to the shareholders, and that the price of gas be reduced from 11s. 8d. to 10s. per 1000 cubic feet, the reduction to take effect from May 22. The report was unanimously approved of. At a meeting of the directors of the Huntley Gaslight Company (Aberdeenshire), held on the same day, it was resolved to recommend to the shareholders, at the annual general meeting, a further reduction of 10d. per 1000 feet in the price of gas. The annual meeting of the shareholders of the Berwick and Tweedmouth Gaslight Company was held on Wednesday week. The report of the directors for the past year showed that a profit of £1126 12s. 3d. was available for division among the shareholders. On the recommendation of the directors, a dividend of 10 per cent. was declared. It was stated by the chairman that, in consequence of the reduction in the price of coal, the price of gas had been reduced from 7s. 6d. to 6s. 8d. per 1000 cubic feet. At a meeting of the directors of the Dysart Gaslight Company, it has been resolved to reduce the present charge for gas from 9s. 2d. per 1000 cubic feet to 7s. 6d.

Most of the annual meetings of the Scotch gas companies have now been held, and in very many cases the directors are settling down to their winter's work, or are making preparations for it. Most of the companies have also concluded their contracts for coal for six or twelve months in advance, and, generally speaking, they have been made on very advantageous terms for the purchasers. There are, however, still a few companies coming into the market for their winter's supplies.

During the four days, commencing last Tuesday, the annual show of the Highland and Agricultural Society of Scotland has been held in Glasgow—the 48th annual show since the society was first formed, and the eighth in Glasgow. It has been an immense success. In connexion with the implement and machinery department there were two stands at which the production of illuminating gas from mineral spirit was shown on such a scale as would be suitable for farmhouses and gentlemen's mansions situated beyond the area of supply of all ordinary gas-works. Stand No. 7 was occupied by the Auto-Pneumatic Gas Company, of London, at which there were shown their auto-pneumatic gas machine, as invented by Mr. Hugh Lewis M'Avoy, and claiming to be a "new invention;" the auto-marque light, and the auto-self-generating gas-lamp, both invented by Mr. Joshua Kidd, and on whose account the same claim was made. There was also exhibited the auto-cooking apparatus, heated by the so-called air gas. At stand No. 80 the Pneumatic Gas Company, of Glasgow, had their well-known gas-making apparatus in operation. It certainly showed to great advantage, more especially from the fact that the illuminating power of the gas was demonstrated in a little tent connected with the stand. In both cases large numbers of people were attracted by the sight, and many inquiries were made by people to whom a gas supply, capable of easy management, would be a very decided advantage. Doubtless a fair stroke of "business" will result from the show.

The Glasgow Corporation Water Committee have lately been considering the question of that area within which the supply of water ought to be confined. A report on the subject had been drawn up by the town-clerk, the engineer to the Water Trust, and the chairman to the Water Committee. After some conversation, the town-clerk was instructed to write to the authorities of the immediately surrounding water-supply districts, such as Airdrie, Paisley, Hamilton, &c., so that the several areas might be mutually arranged. It is now understood that the present water-rates will be continued for another year, and not reduced, as some members of the Water Committee desired.

At the show already referred to there were exhibited several small water pressure engines, which excited a great amount of attention. In Glasgow, Paisley, and Greenock, where the gravitation water supply gives a very considerable pressure, these engines are in great request for driving meat-mincing machines, at butchers establishments and for other purposes, such as churning, pumping,

&c. They are made up to three or four horse power, and work with great economy. The exhibitors, who are also the inventors, Messrs. J. and A. Barr, Glasgow, have been awarded a silver medal, on account of the ingenuity and great serviceableness of their engines.

The manufacturers on the Severn, which drains the loch of that name in Kinross-shire—a stream which probably drives more machinery than any other stream in Scotland—are at present very ill-off for water. Some are producing less, and others are actually contemplating the shortening of the hours of labour. This is a curious fact, as illustrating the unequal incidence of the recent rainfall.

For a number of weeks the Water Commissioners of Dundee have been much "exercised" regarding the opening of their new water-works. On Thursday last the subject was again up for consideration before the Works Committee, but as the testing of the pipes was still proceeding, they could not fix a date for the opening ceremonial. It was remitted to a sub-committee, with full powers to make the necessary arrangements.

Owing to the long-continued dry weather in the water-collecting area of Greenock, the water supply of that town is rapidly diminishing. On the 3rd of July the water in store was 353 million cubic feet, or 101 days supply for all purposes, and on the 17th ult. the supply was only sufficient for 90 days. During the week ending on the 17th of July, there was no rain whatever, and in the preceding week the fall was only 1-10th of an inch.

The local authority for the parish of Cambuslang, which lies adjacent to Glasgow, on the south-east, are about to proceed with the construction of a reservoir and other water supply works. Mr. W. R. Copland, C.E., Glasgow, has planned the proposed works.

In the early part of the week the pig iron market was dull, but by the end of the week it improved somewhat, and prices because rather firmer, the closing quotations on Friday being 60s. buyers, and 60s. 3d. sellers. It was thought that the week's shipments would be about 10,000 tons. Several brands of makers iron were reduced in price 1s. per ton during the week.

The dulness in the coal market continues in the Glasgow district, and some owners are pressing sales. Ayrshire prices were reduced in the beginning of the week, and this will make buyers rather shy in the Glasgow market. Prices are somewhat irregular, and fixed a good deal as the sellers are situated. Steam coal, 9s. to 10s. 6d.; splint coal, 8s. 6d. to 9s.; house coal, 8s. to 10s. 6d.; Wishaw main coal, 7s. 6d. to 8s.; smithy coal, 14s. 6d.; all free on board at Glasgow Harbour cranes. There is a better report from Fifeshire.

Reductions in the Price of Gas.—The Malton Gaslight and Coke Company have just decided to reduce the price of gas from 4s. 6d. to 4s. 2d. per 1000 feet. The Romsey Gas Company have reduced their price to 5s. At Canterbury the price has been reduced to 4s.

Export of Coal.—From the annual parliamentary return relating to the export of coal, it appears that in the year 1874 the quantity of coals, cinders, and patent fuel exported from Newcastle was 3,282,812 tons, and from Cardiff 3,011,765 tons; from all ports of Northumberland and Durham 5,852,631 tons, and from the ports of Wales 4,292,422 tons; the export from the whole of the United Kingdom reaching the large amount of 13,927,205 tons. The quantity of coals, cinders, and culm shipped not for foreign parts, but coastways, from port to port of Great Britain, in 1874 was 9,609,224 tons; and in this traffic Cardiff loses its position, the shipment from that port being only 840,696 tons, but from Newcastle 2,255,414 tons, and the whole shipment from Welsh ports being but 2,278,780 tons, while the shipment from ports of Northumberland and Durham coastways was 4,785,085 tons. Our shipments of coal to France and Germany constitute nearly one-third of our total export of coal, to foreign countries and British possessions.

Pollution of the Thames.—The Thames Conservators, in their report, dated the 5th ult., observe: "On reviewing the results of the notices served on various persons and places requiring the diversion of sewage or other offensive or injurious matter from flowing into the river, the conservators are enabled to report that above the intakes of the water companies only four towns still pass their sewage into the river; of these, two—Oxford and Reading—have sewage works in a forward state, and of the other two, Windsor has commenced the sewage works, and Abingdon is about to do the same; a hope may therefore be entertained that above the source of the chief water supply of the metropolis all sewage will very soon be diverted from the river. Between the intakes of the water companies and the western limits of the metropolis, where the main drainage scheme comes into operation, a less satisfactory state of matters prevails. Notwithstanding the measures taken by the conservators under their Acts of Parliament, the local authorities, with the exception of Twickenham, have not yet diverted their sewage from the river. The conservators will not relax their efforts to enforce a compliance with the provisions of the Conservancy Acts until the diversion of the sewage and the consequent purification of the river above the limits of the metropolis has been fully accomplished."

Hanley Gas Supply.—At the meeting of the Hanley Town Council on the 27th ult., the mayor (Mr. Carltidge) presiding, a report was brought up from the General Purposes Committee, which stated, *inter alia*, that the committee had passed a resolution expressing regret at the decision of the British Gas Company declining to deal with the council for the transfer of their Etruria works, and recommending the council to consider what steps, if any, should be taken with a view to acquiring the works. Mr. Hammersley moved that the council instruct the committee to inquire if any compulsory means could be adopted for the purchase of the gas-works, and further to inquire into the charge made for gas in Hanley, as compared with that in other places. In Hanley, he said, gas was 3s. 6d. per 1000 feet, but in Walsall it was 2s. 4d., in Wolverhampton 2s. 9d., and in Hull the British Gas Company (which supplied Hanley) sold gas for 2s. 6d., although they had to convey coal 60 or 80 miles. Birmingham had recently established, after a very hard fight, the principle of a corporation compulsorily purchasing a public company, and it was for that council to consider whether they should go to Parliament for similar powers, or whether the price of the gas supplied to them could not be lowered. At Congleton the gas-works in the hands of the corporation produced sufficient profits to do away with the borough rate. Alderman Stephenson seconded the motion. The mayor thought the best course would be to at once instruct the committee to go to Parliament for the compulsory purchase of the gas-works. The resolution was then put and carried.

Suffocation by Gas.—On the 24th ult. a woman and her grand-daughter, who had been left in charge of a mansion at Torquay, were suffocated by an escape of gas from a defect in the fittings. On the following morning, as the house remained shut up, a communication was made to the police, and a sergeant went to the place and broke open a window on the ground-floor. He proceeded upstairs, and broke open the door of the room in which the women lay. Dr. Powell, who happened to be passing near at hand, was immediately summoned, and pronounced life to be extinct. On examination the gas was found to be turned on at the meter, and the leakage occurred in the room through the removal of a bracket, and no plug being inserted in the pipe. The inquest on the bodies was opened before Mr. H. Michelmore, coroner, at Edenhurst, on Monday. The evidence given by the witnesses bore out the foregoing statement, and a gas-fitter, lately in the employ of Mr. Fouraker, deposed that about two months ago he removed the gas-bracket from the room in which the deceased were found, and that he plugged the end of the pipe. Mr. Fouraker stated that when the gas was reconnected on the Saturday he made a general examination of the pipe, but did not enter the room of the deceased, as she had the key of the door, which was locked. The jury said the cause of death was inhaling gas, and censured Mr. Fouraker for not making an examination of the pipe in the room in which the deceased were found.

The Gas-Fitter Sold.—The other day one of our printers, not 100 miles from Chester Bridge, perceiving a strong smell of gas in his cellar, sent down to the gas-works for some one to examine the pipes. Accordingly a man was sent, who, having found the leakage, stopped it with white lead, and then returned for his tools; he also brought a labourer named Joe to assist him. On arriving, the printer went down into the cellar with the men, but being suddenly called up to take a large order for printing, the men where left alone. They soon began to have a look round, when suddenly the fitter exclaimed, "By gom, Joe, we are reet this time! He (the printer) has gone up and left the key in the barrel; we will have a drop before he comes back." But the puzzle was they had nothing to drink out of; so it was agreed that each one should lie down on his back with his mouth under the tap, while the other should turn the tap on till his thirst was quenched. The fitter of course must have first drink of Barclay's stout, as he thought, and he lay down and fixed his mouth under the tap. "Go on, Joe," he said; whereupon Joe turned the tap on, and he got a good gulp, but he very unexpectedly rolled over and jumped up, and began to spit and sputter, and shouted as well as he could, "Run for the doctor, Joe; I am poisoned!" Off Joe ran, and was tearing through the shop when Mr. Printer says, "Hallos, my man, what's the matter?" "Why," says Joe, "my mate's been drinking your porter, and it's poisoned him, and I am going for the doctor." Whereupon Mr. Printer burst into a fit of uncontrollable laughter, and said, "Why, the fool's been drinking my black ink!"—*Warrington Guardian.*

Hull Gas Supply.—On the 23rd ult., a meeting of the Gas Inquiry Committee was held to receive a report from the sub-committee as to the result of their interviews with the several gas companies supplying the district. The chairman (Mr. Elam) said the result was that they were not likely to get much remedy from the companies. The Kingston Company partly promised that they would reduce something to the tune of 6d. per 1000, but that was a small amount when the price was 4s. 6d. With regard to the price of the lamps in the streets, they did not appear to listen to any suggestion for a reduction, either in the Old Town or the Sutton district. He thought, therefore, they had come to the conclusion—at least he had—that it was time they sought a remedy from some other source. The mode of procedure, with a view to finding a remedy, they would no doubt consider at that meeting. It would, he thought, be well to consider whether they would ask for a Board of Trade inquiry, and show that Hull was labouring under a serious evil and wrong. They had three gas companies, one—the British—supplying gas for private use at 2s. 6d. per 1000, and £3 5s. per annum per lamp, whilst in the Sutton district the price was 4s. per 1000, and £4 7s. 6d. per lamp; and in the old town 4s. 6d. and £4 per lamp. They found from a conversation with the directors of the Sutton Gas Company that their consumption was very small indeed, and that, he thought, was easily accounted for. In that district there were very few private houses in which gas was used, and he believed that if the price was more reasonable they might fairly expect more customers. The same might be said of the street-lamps, for, if the price was less, the board might give the people more light, and it would certainly be better for the company if they could only see it. This town paid in the year 1874 £6487 0s. 10d. for street lighting, and that, he thought, was a very large item, when they considered a statement in the report as to the lighting of Walthamstowe, in Essex. They had taken the remedy into their own hands, and they now produced a light in the streets at a cost of £2 per lamp, and they were perfectly satisfied with the light. The sub-committee's report contained a letter from the Kingston, and another from the Sutton Gas Company. The first letter stated that, owing to the company's very limited income, they could not make any reduction in the price of gas, and the directors of the Kingston-upon-Hull Gas Company stated that their accounts for the half year had not been made up, and when they were completed the directors would see if they were in a position to make any reduction. The chairman said he thought they ought to prepare a memorial, to submit to the Board of Trade, for an inquiry into the matter in dispute between the board and the gas companies. Mr. Ansell asked what would be the cost of such inquiry. The law clerk said it would be about £25. Alderman Bannister: It will be £500. The law clerk said it could not possibly be so much. Alderman Bannister: The inquiry about the small gas-works at Brough cost £100. After some further discussion it was resolved that the clerk communicate with the solicitors of the Kingston-upon-Hull Gas-Works, and the Sutton, Southcoates, and Drypool Gas-Works, stating that their letters are not satisfactory, and asking them to state the terms on which they would sell the respective works to the corporation, such reply to be sent in on or before the 23rd of August.

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

2616.—Barnett, S., Hackney Road, London, "Improvements in apparatus for controlling, regulating, measuring, and arresting the flow or discharge of fluids or liquids and preventing waste thereof." July 23, 1875.

2620.—Hellyer, S. S., Strand, London, "Improvements in apparatus for preventing waste of water." July 23, 1875.

2621.—Gill, D., Weston-super-Mare, "Improved methods and apparatus for neutralizing and deodorizing the poisonous and noxious gases emitted from sewers and drains, and also the sewage matters contained therein." (Complete specification.) July 23, 1875.

2632.—Morris, R. W., and Hunter, J. C., Barrow-in-Furness, Lancs, "Improvements in apparatus for registering the rise and fall of liquids." July 24, 1875.

2639.—Goldsmith, G., Leicester, "Improvements in gas-meters." July 24, 1875.

2653.—Howard, T., Norfolk, "Improvements in the purification of gas." July 27, 1875.

2668.—Spikes, J. A. L., Handsworth, Stafford, "Certain improvements in high-pressure steam, water, or other valves." July 28, 1875.

2675.—Hanson, J., Dewsbury, York, "Improvements in the treatment of sewage and in the manufacture of manure therefrom." July 28, 1875.

2680.—Meason, J. C., Birmingham, "Improvements in gas chandeliers." July 28, 1875.

2685.—Redwood, T. B., North Finchley, London, "Improvements in the manufacture of gas." July 29, 1875.

GRANTS OF PROVISIONAL PROTECTION.

2508.—Lake, W. R., Southampton Buildings, London, "An improved liquid-meter." A communication. July 12, 1875.

2557.—Grauhan, F. W., Bradford, "Improvements in apparatus employed in the filtration of water, sewage, and other fluids." July 17, 1875.

2605.—Johnson, J. H., Lincoln's Inn Fields, London, "Improvements in blowers or apparatus for compressing or forcing fluids." A communication. July 21, 1875.

NOTICES TO PROCEED.

1955.—Livesey, G. T., Old Kent Road, London, "Improvements in apparatus used in the purification of gas." May 28, 1875.

2492.—King, T., Langley, Worcester, "Improvements in direct-acting steam-pumps." July 10, 1875.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

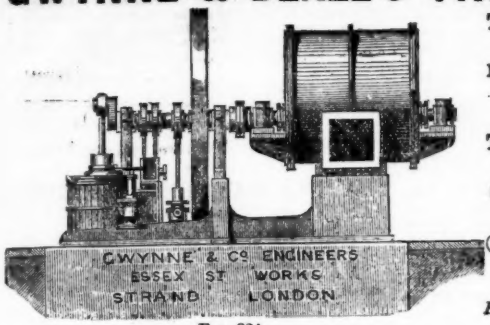


FIG. 224.

The BEST EXHAUSTERS IN THE WORLD.

Made under the personal superintendence of

Mr. BEALE,

The oldest Maker, Inventor and Patentee of

GAS-EXHAUSTING MACHINERY.

(It is NOT CORRECT to state that Mr. BEALE has RETIRED.)

Prices and every information on application.

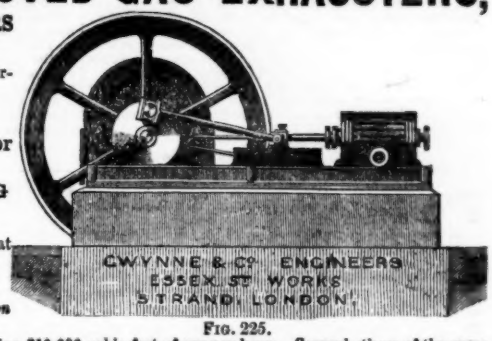


FIG. 225.

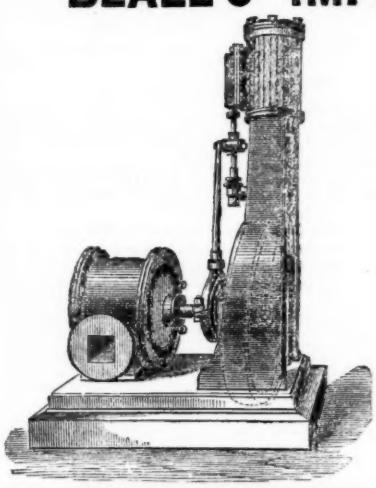
Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,
CAN BE HAD ON APPLICATION TO

GWYNNE & CO., HYDRAULIC & GAS ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.

G. & Co. are now manufacturing for a London Gas Company three of their 210,000 cubic feet Patent Gas Exhausters, and many of all sizes.

BEALE'S IMPROVED PATENT GAS-EXHAUSTER



WITH

ENGINE COMBINED

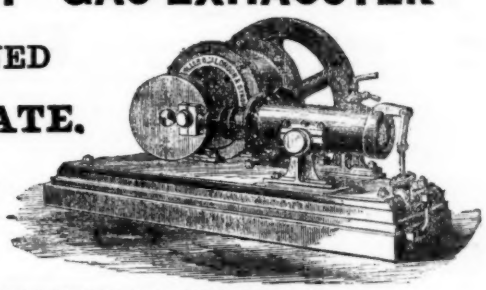
ON

ONE BASE PLATE.

SOLE MAKERS,

GEORGE WALLER & CO.,

Who, since Mr. BEALE'S retirement, are the Oldest Makers.



EXHAUSTERS with HORIZONTAL ENGINE combined.
EXHAUSTERS with OUTSIDE BEARINGS.
MAKERS of ENGINES, BOILERS, and GAS MACHINERY.
TAR, LIQUOR, and SYPHON PUMPS. GAS-VALVES in stock, 2 to 30 inches.
SELF-ACTING BYE-PASS VALVES, with Lid and Relieving Lever.
MANN'S and many other descriptions of WATER DISTRIBUTORS.
SCRUBBERS, PURIFIERS, and CONDENSERS.
EXHAUSTERS from 3000 to 60,000, new and second hand, in stock.

PHŒNIX ENGINEERING WORKS, HOLLAND STREET, S.E., & at STROUD, GLOUCESTERSHIRE.

D. BRUCE PEEBLES & CO.,

ENGINEERS,

FOUNTAINBRIDGE WORKS, EDINBURGH,

MANUFACTURERS OF WET AND DRY GAS-METERS;

Patentees and Sole Manufacturers of PEEBLES' LAMP-GOVERNORS,

ABOVE 30,000 OF WHICH ARE NOW IN USE.

"These Lamp-Governors are so superior that they are likely to supplant all others."—*Dr. Wm. Wallace, F.R.S., F.C.S.*

D. BRUCE PEEBLES AND CO., FOUNTAINBRIDGE WORKS, EDINBURGH.

FLEETWOOD GAS COMPANY, LIMITED.

WANTED, at once, a Working Manager for the Gas-Works, Fleetwood. Must understand laying mains, executing general repairs, fixing meters, &c.

Apply, stating salary required, and enclosing copies of testimonials, to J. T. HALL, Managing Director, Prescot, LANCASHIRE.

TO GAS DRAUGHTSMEN.

WANTED, a practical and expeditious DRAUGHTSMAN, accustomed to constructions and plant about Gas-Works, and who could superintend extensions, &c.

Address No. 185, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a person to act as Clerk of WORKS. He must be qualified to superintend the erection of a new work, make tracings, and drawings if necessary. Applicants to state terms and former experience.

Address No. 184, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, a situation as MANAGER of a Gas-Work. Competent to lay mains and services, fix meters, and do general repairs, having had 17 years experience in a gas-work. (No objection to stoking.) Good testimonials.

Address, care of W. RICHARDSON, Gas Engineer, 93, Charles Henry Street, BIRMINGHAM.

WANTED, a Youth as Assistant Gas-FITTER.

Apply, by letter, to SECRETARY, Gas and Water Works, MONMOUTH.

WANTED, by a young Man, aged 23, a situation as CLERK or Meter Taker and Collector. Has been four years in present situation, and can produce testimonials as to ability and character.

Address No. 182, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS ENGINEERS, &c.

WANTED, by the Steyning Gas Company, Limited, an Iron GASHOLDER, to contain 1500 cubic feet, with balances, &c., complete.

Apply, by letter, to Mr. J. P. DURRANT, Manager, STEYNING.

GAS MANAGER WANTED.

WANTED, by the Arbroath Gas Corporation, a properly qualified person to act as MANAGER of their works, to enter on his duties on Monday, the 30th of August next, or as soon thereafter as may be arranged. Salary £130 per annum, with a free house, coals, gas, and taxes.

Further particulars may be obtained on application to DAVID CHAPEL, Solicitor, Arbroath, Clerk to the Corporation, with whom applications and testimonials are to be lodged on or before the 16th of August next.

Arbroath, July 28, 1875.

WANTED, by the son of a Gas Engineer, the MANAGEMENT of a Gas-Work, where a stoker is kept in the summer time, or Assistant Manager of a larger work, and to take the out-door superintendence, the reading of meter indices, and collection of accounts, &c.

Address No. 179, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

NEW EDITION, NOW READY,

ADVANTAGES OF GAS FOR COOKING AND HEATING.

By MAGNUS OHREN, A.I.C.E., F.C.S.

For Companies to issue to their Gas Consumers.

Specimen Copy by post Threepence, direct from MAGNUS OHREN, Gas-Works Lower Sydenham, London, S.E.

THE Directors of the Horsham Gas Company invite TENDERS for their surplus TAR, from Aug. 15, 1875, to Aug. 15, 1876.

The quantity is expected to be about 10,000 gallons.

The purchaser to take the Tar when required in quantities of about 20 barrels, to find his own barrels, and to pay railway carriage.

The Company to convey the Tar to the railway station.

Sealed tenders, stating price per gallon, and endorsed "Tender for Tar," to be sent in on or before Monday, Aug. 9, to R. SHEPPARD, Secretary.

NEATH GAS-WORKS.

TO IRONFOUNDERS.

THE Gas Committee of the Neath Corporation hereby invite TENDERS for the supply of Cast-Iron Socket and Spigot GAS-PIPES, of 4 in., 6 in., 8 in., and 10 in. diameter, with such Syphons, T's, Bends, &c., as may be required, in accordance with drawings and specification, which may be seen on application to the Engineer, Mr. Ellery, at the Gas-Works, Neath.

Tenders, endorsed "Gas-Pipes," must be delivered to me on or before the 7th of August, 1875.

The Gas Committee do not bind themselves to accept the lowest or any tender.

By order,
ALFRED CURTIS, Town-Clerk.

Town-Clerk's Office, Neath, July 26, 1875.

FOR SALE—A 4-horse Engine and Exhauster, to pass 10,000 cubic feet per hour. Self-acting bye-pass and two gas-valves, 8-in. connexions and exhauster governor.

For further particulars, or to view the same now working, apply at the GAS-WORKS, WALTON-ON-THAMES.

THE Scarborough Gas Company have FOR SALE, in consequence of removing to their New Works, a first-class Telescope GASHOLDER, 52 ft. in diameter and 44 ft. deep. It was made and erected by C. and W. Walker, of Donnington, in 1868, and is in excellent condition. It is of remarkably good workmanship, being perfectly circular and true, and free from all irregularities. The columns and girders are of handsome design and highest class of work.

Gas Companies wanting a good Gasholder this year will find this an advantageous opportunity.

For further particulars apply to
JAMES MOON, Gas Engineer, Scarborough.

THE Pinner Gas Company invite Tenders for their TAR from Aug. 31, 1875, to Aug. 31, 1876.

The quantity will be about 5000 gallons.

The Tar will be delivered free into the purchaser's tank truck at Pinner siding, London and North-Western Railway Company.

Tenders to be sent to Mr. E. BULL, Gas Company, Pinner, near WATFORD, on or before Monday, Aug. 16.

THE St. Day Fire-Brick and China Clay Company, Limited, having largely increased their works, are now prepared to TENDER in any quantity for the supply of their well-known BRICKS and other FIRE GOODS, either for the Home trade or exportation. Prices and samples will be forwarded on application to the works, St. Day, CORNWALL, or the London Offices, 7, St. Bene't Place, GRACECHURCH STREET.

RIPON CITY GAS-WORKS.

MANAGER WANTED.

THE Local Board for this City wish to engage a thoroughly competent and experienced MANAGER for their Gas-Works, at a salary beginning at £100 per annum, with a good house and garden rent free, and coals, gas, and water; and the parochial and local board's rates will be provided, or paid for, for him.

Applications, in the candidate's own writing, marked on the outside, "Gas-Works Manager," and stating age and previous employment, with testimonials as to character and fitness for the appointment, are to be sent in on or before Saturday, the 14th day of August next, to me at my Offices in Ripon, where also any further information required may be obtained.

R. W. NICHOLSON,
Town-Clerk and Clerk to the Local Board.

Ripon, July 28, 1875.

TO COLLIERY OWNERS, &c.

THE Directors of the Barnsley Gas Company hereby invite TENDERS from parties willing to contract to supply and deliver into the retort-houses, at their works, situated at Old Mill and Pontefract Road, Barnsley, respectively, all the screened soft COAL, of the best quality, suitable for gas-making, that they may require for a period of One, Two, or Three years, as may be agreed upon, from the 1st day of October, 1875. The said Coal to be delivered in a dry condition, free from smudge, dirt, shale, pyrites, or other impurities, at either of the said works, in such quantities and at such times as the Manager may direct. There are railway sidings into both works.

Sealed tenders, stating respectively the price of coal delivered as above, endorsed "Tender for Coal," and addressed to the Chairman, must be left at the Gas Company's Office, on or before Thursday, the 5th day of August next.

Any further information required may be obtained on application to the undersigned.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
JOHN HUTCHINSON, Manager.

Gas Offices, Pontefract Road, Barnsley, July 22, 1875.

THOMAS ALLAN & SONS, of Springbank Iron-Works, Glasgow, manufacture small cast-iron GAS AND WATER PIPES, 1½ to 6 inches, at their branch works, Stockton-on-Tees, and have at present a large stock, which they are open to sell at moderate prices.

BAILEY'S Patented Inventions are now in extensive use wherever steam is known. Bailey's Patent Steam Gauges, Pyrometers, Water Gauge Cocks, Test Pumps, Fusible Plugs, Steam and Water Valves, Safety Valves, Junction Valves, Pumps, Tell-Tales, Recorders, Lightning Conductors, Electric Telegraphs, Turret Clocks, Steam Joint Cement, Lifting Jacks, Boiler Feeders, Lime Catcher and Separator, Injectors and Ejectors, and every description of first-class Brass Work for Engines and Boilers. Gas-Works Managers who have not our large book should send for it.

16th edition, 1000 engravings, 4to., post free 2s. in stamps, weight 10 oz., cost of production £1000,

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J. BAILEY and Co., Albion Works, Salford, LANCASHIRE.

RATCLIFF GASLIGHT AND COKE COMPANY.

OFFICES, 345, CABLE STREET, LONDON, E.,
Aug. 3, 1875.

NOTICE is hereby given that a HALF-YEARLY GENERAL MEETING of the SHAREHOLDERS of this Company will be held at the Company's Offices, as above, on FRIDAY, the 20th day of August inst., at Two o'clock in the afternoon precisely, to declare a Dividend for the half year ended June 30, 1875, and for other general purposes of business.

And NOTICE is hereby further given that the register of transfers will be closed from the 16th of August inst. to the 20th of August inst., both days inclusive.

By order of the Board,
H. J. BADDELEY, Secretary.

CATHELS'S Patent District Dry Gas-GOVERNOR is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, ROTHERHAM.

CATHELS & TERRACE'S Patent Four-WAY DISC GAS-VALVE is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By its use the flow of the gas cannot be accidentally stopped, and it never sticks.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

WOLSTON'S TORBAY IRON PAINTS.

THE Torbay and Dart Paint Company, Limited, 23, Great George Street, Westminster, S.W., having been informed that PAINTS not manufactured by them are being offered to Gas Companies and the public as "WOLSTON'S," hereby give notice that they will TAKE PROCEEDINGS against any persons infringing their rights as sole proprietors and manufacturers of Wolston's Torbay Iron Paints.

(See Advertisement on another page.

IN THE MATTER OF BRONNER'S PATENT BURNERS.

NOTICE is Hereby Given that Julius Brönner, on the 20th of April, 1875, in a suit in Chancery, 1874, B 365, obtained an injunction perpetually restraining the Defendant, his Agents, Servants, and Workmen, from in any way advertising or offering for sale, or selling, or from in any manner causing to be advertised, or offered for sale, or sold as "Real Brönner," or "Brönner," or "Broehner" Burners, any Burner not manufactured by or for the Plaintiff, Julius Brönner, or by his Agents.

JACKSON, FOX, AND ELLEN,
55, Chancery Lane, London,
Solicitors for the Plaintiff,
JULIUS BRÖNNER, Frankfort-on-Maine.

SPENT OXIDE OF IRON.

We are open to
BUY EITHER LARGE OR SMALL PARCELS.
State quantity and price, put free on rails, or delivered here to
JOHN NICHOLSON & SONS, CHEMICAL WORKS, HUNSLET, LEEDS.

C. & W. WALKER'S
WOOD PURIFIER SIEVES,

Which have now been used for twelve years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE.
8, FINSBURY CIRCUS, LONDON.

Just published, price 10s. 6d.,

REGISTRATION OF DISTRIBUTORY PLANT.

The forms for this purpose are to illustrate the Paper on Distribution of Gas, read at the Edinburgh Meeting of the British Association of Gas Managers. By the use of the synopsis the whole of the out-door plant may at once be seen, with all matters pertaining to the same.

W. J. WARNER, Engineer.
South Shields.

Now ready, price 7s., by Post 7s. 3d.,

A SECOND EDITION (feap. 8vo., morocco gilt)
OF
THE GAS MANAGER'S HANDBOOK,
CONSISTING OF
Tables, Rules, and Useful Information for Gas Engineers, Managers,
And others engaged in the Manufacture and Distribution of
COAL GAS.

BY THOMAS NEWBIGGING, A.I.C.E.

WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

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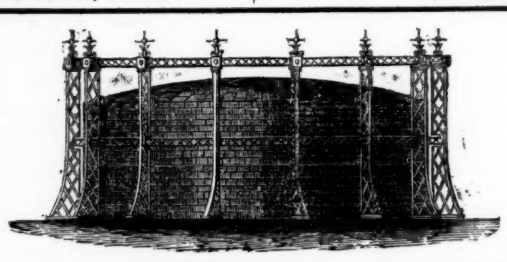
Indispensable to the Profitable Manufacture of Gas.
SOLE MANUFACTURER,
WILLIAM RICHARDSON,
CHARLES HENRY STREET & BISSELL STREET, BIRMINGHAM.
Gas Apparatus of all Descriptions supplied Complete and in Detail.



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TIPTON, STAFFORDSHIRE.
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MANUFACTURERS OF
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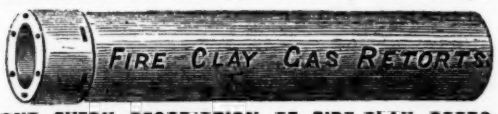
Manufacturers of FIRE-BRICKS, LUMPS, TILES,



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GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,

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SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,

AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.

THE THAMES BANK IRON COMPANY,

(Successors to LYNCH WHITE,)

SUPPLY FROM STOCK

CAST-IRON RETORTS, SOCKET-PIPES for GAS or WATER PURPOSES, FLANGE-PIPES for STEAM, RAIN-WATER PIPES and GUTTERS, HOT-WATER PIPES and BOILERS, and all requisite Connexions for same; also LAMP-COLUMNS, LAMPS, WROUGHT FRAMES, WROUGHT-IRON TUBING, &c., &c.

All kinds of Gas-Works Apparatus and General Castings made to Pattern or Drawing.

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OLD BARGE WHARF, UPPER GROUND STREET, LONDON, S.E.

GEORGE ORME & CO.,

GAS METER MANUFACTURERS, BRASSFOUNDERS & FINISHERS,

ATLAS METER-WORKS, OLDHAM.

CONSUMERS WET & DRY GAS-METERS ON THE MOST APPROVED PRINCIPLES.

STATION-METERS, GOVERNORS, PRESSURE-REGISTERS,

And every Description of Gas Apparatus.

GAS, STEAM, AND WATER FITTINGS.

D. A. GRAHAM,

CONSULTING GAS ENGINEER,

STALYBRIDGE, NEAR MANCHESTER,

Erects Horizontal Condensers, Retort Settings, Pumps, Self-Acting Exhauster Governors, Coal-Testing Apparatus, &c., &c.

Gas-Works surveyed, mapped, and reported on, and extensions or alterations designed and the particulars specified, and work estimated for and executed.

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GLASGOW,

Supplies every requisite in connexion with the distribution of Gas and Water.

Estimates and prices on application.

WOOD GRIDS for Purifiers and Scrubbers.

Cast-Iron PIPES and VALVES.

Street LAMP-PILLARS.

Patent Pipe SCREWING-MACHINES, &c.

Mr. ALFRED LASS,

60, CORNHILL, LONDON, E.C.,

Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.

To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.

To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

WM. RICHARDS,

INVENTOR OF THE DRY GAS-METER,

REVISER OF "HUGHES ON GAS-WORKS,"

CONSULTING GAS ENGINEER,

Advises on all matters of business connected with Gas Lighting. Furnishes Working Drawings of Retort-Settings, Specification of Works, complete or in detail.

11, ST. MICHAEL'S ROAD, STOCKWELL, LONDON, S.W.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

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Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Keep in London and at their works large stocks of PIPES and CONNEXIONS (1½ to 36 inches in diameter); also make and supply Retorts, Tanks, Columns, Girders, Special Castings required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

CHARLES HORSLEY, Agent.

CAFFALL, THOMAS, & CO.,

LIMITED,

Are prepared to supply and erect their

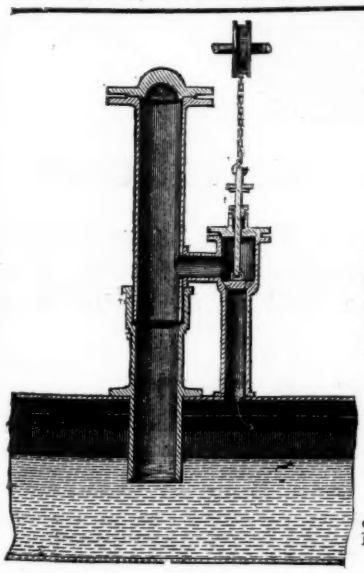
PATENT MOVEABLE SEALS

FOR DIP-PIPES,

Or to grant Licences for the Manufacture and Use of the same.

Particulars may be obtained on application at the Offices,

75, FLEET STREET, LONDON, E.C.



COPP'S PATENT GAS APPARATUS

For the Removal of all Pressure caused by the Hydraulic Seal;

THE EFFECTS PRODUCED BEING

1.—A LARGE INCREASE IN THE YIELD OF GAS.

2.—AN ENTIRE PREVENTION OF THE DEPOSIT OF CARBON.

3.—THE ASCENSION-PIPES DO NOT CHOKE.

The apparatus is very simple in construction, and cannot get out of order, and being an outside addition to the present arrangement of works, can be applied so easily as to require no alteration of plant. It may be fitted whilst the retorts are in use, without interfering with the manufacture of gas. The cost is so small that the outlay will be repaid in a few weeks' working. For further particulars apply to the Patentee,

W. L. COPP, WATCHET GAS-WORKS, SOMERSET,

or, 232, BRIXTON ROAD, LONDON, S.W.

The following is the opinion of JAMES PATERSON, Esq., President of the British Association of Gas Managers:—

WARRINGTON, *July* 12, 1875.

DEAR SIR,—I am obliged by your drawings, and cannot but say to you that I entertain a favourable opinion of your patent arrangements for the removal of the hydraulic seal when the retorts are in operation. It appears to be amongst the best, and probably the best, of the various devices in use for that purpose.

Mr. W. L. COPP. Yours truly, JAMES PATERSON.

WARNER AND COWAN'S
SELF-REGULATING GAS-METER,

PATENTED IN

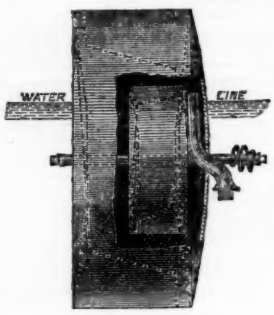
GREAT BRITAIN, FRANCE, AUSTRIA, PRUSSIA, BELGIUM, AND THE UNITED STATES.

OPINION

OF

W. RICHARDS, Esq., London, Inventor of the Dry Gas-Meter.

"Your improvement in the Wet Meter is decidedly the best that has been introduced since its invention; exceedingly beautiful and simple, which renders the instrument mathematically correct, and infinitely more accurate than any means in general usage for the measurement of liquids."



OPINION

OF

WILLIAM MANN, Esq., late Superintendent of the Chartered Gas-Works, Blackfriars, London.

"I saw a model of your Wheel to day,* and certainly think it the best addition that the Wet Meter has received since its invention, to ensure correct registration until the closing of the valve."

* Sept. 8, 1874.

From "THE JOURNAL OF GAS LIGHTING," Jan. 5, 1875.

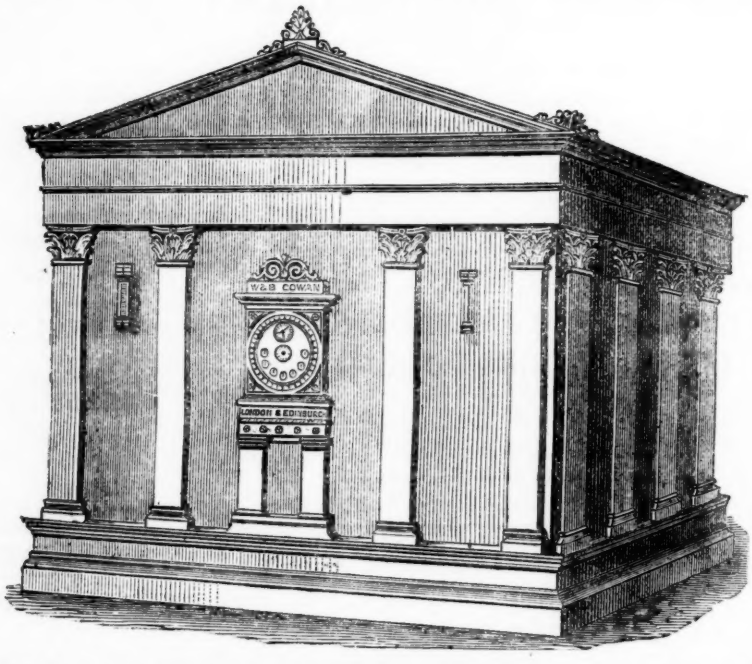
"The changes effected in the construction of the wet meter are such that it now occupies a position which it never held before—that of an unvarying measure. . . . . Both company and consumer are now equally protected, perfect accuracy of measurement is obtained, and that, too, without the least increase of mechanism, or the action of the meter in the least degree being prejudicially affected."

BRITISH ASSOCIATION OF GAS MANAGERS, Leeds, 1875. Inaugural Address of the President, JAMES PATERSON, Esq., F.G.S., of Warrington.

"There are, however, degrees of what may properly be termed excellence; and this leads me to notice one of the most beautiful applications which science has yet devised in the construction of the meter, and which has rendered it an absolutely reliable and unvarying instrument. . . . . The object aimed at, and most admirably accomplished, is to change the varying measurement of a varying water-line to an unvarying measure with a varying water-line and annulus."

Original Licensees and Manufacturers: W. & B. COWAN.

EITHER WITH COMMON DRUM OR



WARNER AND COWAN'S SELF-REGULATING DRUM.

W. & B. COWAN'S SQUARE STATION-METER with PLANED JOINTS.

W. & B. COWAN'S large and increasing Export Trade is provided for by their keeping constantly on hand a very large stock of both Wet and Dry Meters, ready for immediate despatch to the British Colonies and Foreign Countries.

W. & B. COWAN,

ESTABLISHED 1827,

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BALLS POND ROAD,
(NEAR DALSTON JUNCTION STATION,) **LONDON, N.**

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WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

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GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

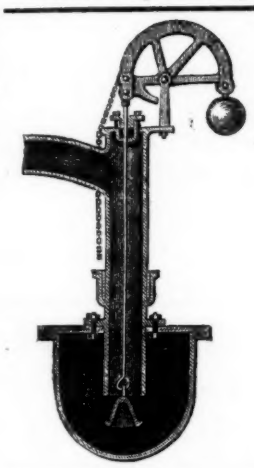
2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.



BOX'S PATENT ANTI-DIP VALVE

Affords a clear gas way through the dip-pipe while the retort is in action, and produces a perfect seal at pleasure, or whenever the retort is open, offering great security against the drawing of air, and obviating the necessity for using any liquid in the now so-called hydraulic main. It is easy of application to existing apparatus, and is comparatively inexpensive. Is not likely to get out of order, as the tar, which will adhere to the botton of the dip-pipe and the flange of the cone, both of which are faced, will act as a lubricant, and prevent undue wear and tear. The whole, as will be seen on inspecting the accompanying illustration, is exceedingly simple, and every part accessible. To adapt it to the present dips, all that is necessary is to face the bottom edge of the dip-pipe, and suspend a cone by a rod, which passes through the bonnet, the raising and lowering of the cone being performed through the intervention of a weighted eccentric.

The Patentee is prepared to supply Patented Apparatus upon the most moderate terms, and will be happy to reply to any inquiries that may by adddressed as under—

W. BOX,

GAS-WORKS, CRAYFORD, KENT

KÖRTING BROTHERS,

SOLE LICENSEES FOR

W. CLELAND'S PATENT STEAM-JET GAS-EXHAUSTER.

E. KÖRTING'S PATENT STEAM-JET GAS-EXHAUSTER.

Small Cost—Compactness—Perfectly Self-Acting—Self-Regulating—Self-Cleansing—Smallest Boiler Pressure Sufficient—No Steam-Engine—No Gearing—No Attention—No Extra Room Required—No Tear and Wear—No Noise—No Oscillation in Vacuum, or Back Pressure.

UPWARDS of 150 in USE in CONTINENTAL GAS-WORKS.

IN ENGLAND SUPPLIED TO—

Chartered Gas Co., London.
London Gaslight Co., London.
South Metropolitan Gas Co., London.
Phœnix Gaslight and Coke Co., London.
Liverpool United Gaslight Co., Linacre.
Corporation Gas-Works, Bolton.
Cornholme District Gas-Works, near Todmorden.

These Gas-Exhausters are kept in stock in 16 different sizes, delivering from 500 cubic feet to 60,000 cubic feet of Gas per Hour.

E. KÖRTING'S PATENT STEAM-JET REVIVIFYING BLOWERS

For the Purifying Material are kept in Stock in three different Sizes. Upwards of 100 in use.

IN ENGLAND SUPPLIED TO—

Phœnix Gas Co., South Metropolitan Gas Co., Chartered Gas Co., London Gaslight Co., Independent Gas Co., in London.
Gas-Works, Brentford, Middlesex.

We beg to inform Gas Engineers that we are Licensees for

W. CLELAND'S PATENT STEAM GAS-SCRUBBER,

Combining small cost and thorough efficiency with absence of any mechanical means and necessity of renewing the scrubbing material.

For particulars apply to KÖRTING BROTHERS,

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GEBR. KÖRTING, HANNOVER, GERMANY.

SCHUTTE AND GOEHRING, 222, WALNUT STREET, PHILADELPHIA, U.S.

KÖRTING BROTHERS,

STEAM-JET GAS-EXHAUSTERS AND REVIVIFYING BLOWERS FOR OXIDE.

LONDON AGENT AND AGENT FOR SOUTH OF ENGLAND:

GERALD J. TUPP, 8, John Street, Adelphi, W.C.,

To whom all inquiries for these districts should be addressed.

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c., &c.,

SCOTSWOOD FIRE-BRICK WORKS,

SCOTSWOOD-ON-TYNE.

THOMAS LAMBERT & SONS

MANUFACTURE EVERY DESCRIPTION OF

GAS AND WATER FITTINGS;

ALSO,

WROUGHT-IRON TUBES & FITTINGS.

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MOBBERLEY & PERRY,

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FIRE CLAY and BRICK WORKS,

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Proprietors of

BEST GLASS-HOUSE POT and CRUCIBLE CLAY.

Manufacturers for Home and Export.

GAS-RETORTS, GLASS-HOUSE FURNACE, BLAST-FURNACE, & TANK BRICKS, LUMPS, TILES,

And Every Description of Best Fire-Bricks.

"SELLARS' CEMENT"

PREVENTS WASTE OF GAS FROM RETORTS;

SAVES CLAY RETORTS FROM DESTRUCTION BY FIRE;

GREATLY ECONOMIZES THE USE OF FIRE-BRICKS;

And PREVENTS ALL POSSIBLE LOSS of GAS FROM LEAKAGE.

J. C. SELLARS,

THE GAS CEMENT WORKS,

BIRKENHEAD.

B. CARPENTER,

THE ORIGINAL MANUFACTURER OF

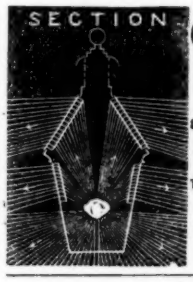
WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

WORKS:

22, HERMES STREET, PENTONVILLE ROAD, LONDON, N.



THE PATENT

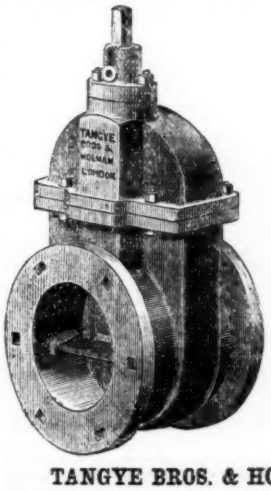
CATOPTRIC LAMP

Is now in use in Moorgate Street, Cheapside, and Trafalgar Square, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.

T. A. SKELTON, 37, Essex St., Strand, LONDON, INVENTOR AND PATENTEE.

IMPROVED

GAS-VALVES,



AT GREATLY REDUCED PRICES.

Inch.	s.	d
2½	24	0
3	27	0
4	36	0
5	45	0
6	54	0
7	63	0
8	80	0
9	90	0
10	100	0
12	135	0
14	180	0

TANGYE BROS. & HOLMAN,

LAURENCE POUNTNEY LANE,

LONDON.

TORBAY AND DART PAINT COMPANY, LIMITED.

WORKS:
DARTMOUTH AND BRIXHAM, DEVON.

OFFICES:
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SOLE PROPRIETORS AND MANUFACTURERS OF
WOLSTON'S CELEBRATED
TORBAY IRON PAINTS.
(ESTABLISHED 1851.)

TRADE MARK

These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Waggon Works, and the Paint Trade generally. They are the BEST PROTECTORS of IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to ironwork. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned colours—ground in best linseed oil, and requiring only before use to be thinned down in the ordinary way—are kept in stock:—

Torbay Brown.	Torbay Red.
Dart Green.	Slate.
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Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
Navy Green.	Lead.
Carriage Red.	Dark Stone.
Light Lead.	Crystal Palace Blue.
Light Green.	Iron Grey.

All other Colours made to order.

PRICES and TESTIMONIALS on APPLICATION.
(See Notice on another page.)

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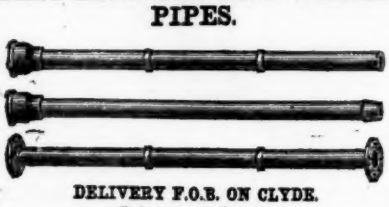
COTTERILL'S PATENT STEEL TUBE-DRILLS, for connecting services to water-mains, *under pressure*, without turning off the water. They drill and tap themselves, and are left in the mains. Made of all sizes, from ¾ to 2 inches and upwards. They cost less than the ordinary plan.
Apply to CHARLES FORSTER COTTERILL, Cannock, STAFFORD, Patentee.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE
FIRE CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
Successors to
E. BAKER AND CO., LATE BRIERLEY HILL, STAFFORDSHIRE.

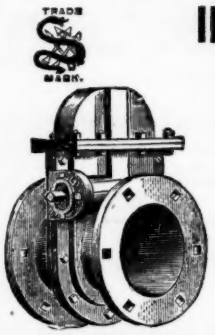
GAS AND WATER PIPES.
WILLIAM MACLEOD & CO.,
18 & 20, ALSTON STREET, GLASGOW.

CAST-IRON GAS AND WATER PIPES.



DELIVERY F.O.B. ON CLYDE.
Prices on application.

B. DONKIN & CO.'S
IMPROVED GAS-VALVES
WITH WROUGHT-IRON PINIONS,



List of prices, with full dimensions of all sizes up to 48-inch, to be had on application.
These Valves are all proved on both sides to 30 lbs. on the square inch before leaving the works, and are always kept in stock.
VALVES MADE WITH OUTSIDE RACKS TO ORDER.
ALSO, SCREW WATER-VALVES WITH GUN-METAL FACES.
ALSO SOLE MAKERS OF
J. BEALE'S NEW PATENT GAS EXHAUSTERS.

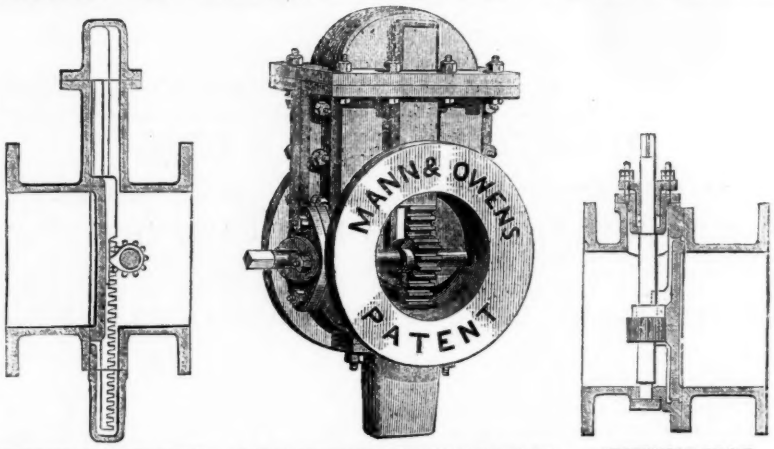
B. DONKIN & CO.,
GENERAL ENGINEERS AND IRONFOUNDERS,
MAKERS OF STEAM-ENGINES,
BLUE ANCHOR ROAD, BERMONDSEY,
LONDON, S.E.

LIME SUPERSEDED
IN THE
PURIFICATION OF ILLUMINATING GAS
BY
SPENCE'S PATENT DRY COPPERAS.

The only purifying material which removes by one process, without injury to the purifiers, all Ammonia and Sulphuretted Hydrogen. It has been in use for upwards of five years at some of the largest Gas-Works in the Kingdom.

TESTIMONIALS SENT ON APPLICATION TO
SPENCE BROTHERS CHEMICAL COMPANY, LIMITED,
VICTORIA CHEMICAL WORKS, BRADFORD, MANCHESTER;
SOLE MANUFACTURERS OF SPENCE'S PATENT DRY COPPERAS,
SPENCE'S PATENT GAS DEODORIZER, AND MUDIE'S DISINFECTANT;
MANUFACTURERS OF
SULPHATE OF AMMONIA, VITRIOL, COPPERAS, &c.;
PURCHASERS OF SPENT OXIDE AND AMMONIACAL LIQUOR, AND CONTRACTORS FOR THE PURIFICATION OF COAL GAS.

MANN & OWENS' PATENT GAS-VALVE.



SECTIONAL ELEVATION. VIEW SHOWING PINION AND RACK. SECTIONAL PLAN.

The advantages of this Patent Valve over all others yet introduced are, that it is always as tight as the best wedge or spring valve, without the possibility of setting fast or becoming suddenly leaky. The surfaces not being in contact during the operation of opening or closing, leakage through wear and tear is avoided.

The Gas Engineer will not fail to see the importance of such a valve in connexion with his purifying apparatus, particularly in the case of large sizes.

The slide being operated either by a screw and nut, or by a pinion and rack, a cam bearing upon a plane, cast on the back of the Valve, forces it against the face, and renders the escape of gas an impossibility. By a slight turn of the pinion or screw, the slide is released, and brought away from the face, by which means friction is avoided, and the only force required to open the Valve is that due to its own weight.

SOLE MANUFACTURERS:
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J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

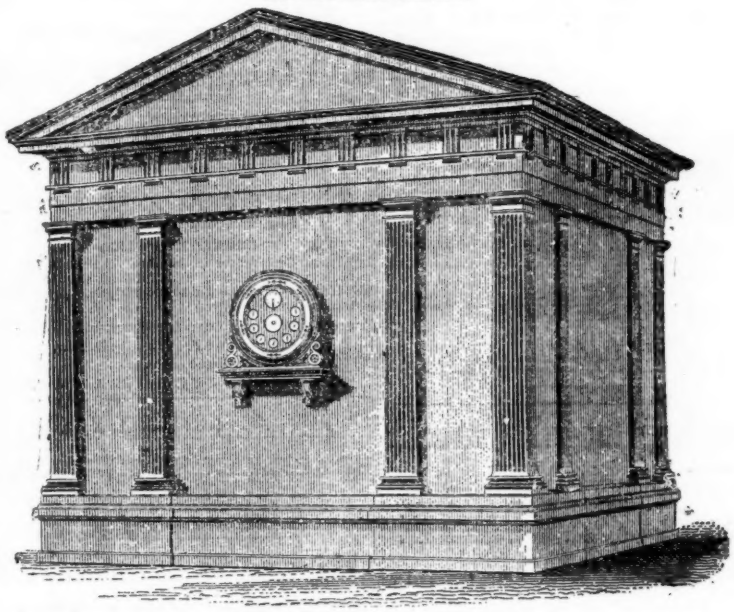
MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS

OF THE HIGHEST EXCELLENCE;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c., ON APPLICATION.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

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MR. ANDERSON advises Companies on all matters connected with the manufacture of Gas and the construction of Works.

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS, heated by tar without the production of smoke.

STEAM-ENGINES and EXHAUSTERS, separately or combined.

FOUR-WAY VALVES, one of which is equal to three ordinary Valves.

STATION GOVERNORS—the Gasholder cannot tilt and cause accident.

BREEZE AND TAR FUEL MACHINE.

A Pamphlet containing Eighteen Illustrations of the foregoing, with letterpress of the construction of Works, post free, 2s. 6d.

N.B.—The second edition of this Work, *now ready*, contains Illustrations of the Machine for converting Breeze and Tar into Fuel for heating the Retorts.

"The Author is well qualified to speak authoritatively upon the important subjects to which his pamphlet refers."—*Artizan*

E. GODDARD,

GAS-WORKS, IPSWICH,

SOLE AGENT FOR

EDGE'S PATENT

FOR REMOVING THE

CARBONACEOUS INCRUSTATION FROM GAS-RETORTS.

HOPKINS, GILKES, & CO.,

LIMITED,

MIDDLESBOROUGH,

SUPPLY GAS & WATER PIPES of EVERY SIZE.

Plain, Turned and Bored, and Coated.

CAST-IRON RETORTS.

Castings for Gas-Works of every description.

EXHAUSTERS.

LONDON OFFICE: 25, LAURENCE POUNTNEY LANE.

LAMP-PILLARS,

GAS-LAMPS, FOUNTAINS.

Our new Illustrated Catalogue contains a choice and extensive selection of designs for these, and is forwarded to any part of the world on receipt of 12s. 6d., which is allowed on first £10 order.

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GAS & WATER ENGINEERS & CONTRACTORS,

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LONDON, E.C.

C. & W. WALKER,

MIDLAND IRON-WORKS,

DONNINGTON, NEAR NEWPORT, SHROPSHIRE,

MANUFACTURERS OF

TELESCOPIC AND SINGLE-LIFT

GASHOLDERS,

CAST & WROUGHT IRON GASHOLDER-TANKS,

CONDENSERS, SCRUBBERS, & PURIFIERS.

LONDON: 8, FINSBURY CIRCUS, E.C.

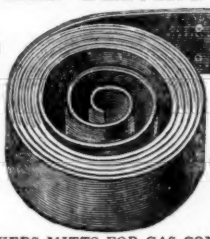
LEATHER DRIVING BANDS,

Hose-Pipes and Fire-Buckets,

Canvas Hose,

Sponge Cloths,

Cotton Waste, &c.



India-Rubber Belting, Hose, Valves, Packing, &c.

Contractors to Her Majesty's Government, Railways, &c.

Price Lists on application.

STOKERS MITTS FOR GAS COMPANIES.

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POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.
One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.
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Cubic Feet. 10,000 .. Illuminating Power. 20 candles. .. Coke (sup. qual.). 12 cwt.

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Beg leave to call the attention of Gas Companies to the superior quality of their
CANNEL FOR GAS-MAKING PURPOSES.
This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.
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Waggons supplied for delivery by railway to any part of England or Wales.
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STRONGLY RECOMMEND A TRIAL OF THEIR
CELEBRATED SILKSTONE GAS NUTS.
Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—
(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.
Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.
These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.
APPLICATIONS FOR PRICES, &c., TO BE SENT DIRECT TO THE COLLIERY, AS ABOVE.

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The Wigan Coal and Iron Company, Limited, incorporated 1865, are the exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL COLLIERIES.

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THE DERBYSHIRE
SILKSTONE COAL COMPANY,
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CAN OFFER A
GAS COAL
Of superior quality, delivered at any station in England and Wales.

Purified gas per ton of coal in cubic feet (average)	10,775
Weight of coke in lbs. per ton of coal	1,465

ANALYSIS AND PRICES ON APPLICATION TO
Mr. EDMUND TAYLOR, Secretary,
ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD

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COMPANY, LIMITED.
Works: LOCHORE by LOCHGELLY, FIFESHIRE. Office: 19, MAITLAND STREET, EDINBURGH.

This Company request attention to the very superior quality of their Cannel Coals.

1. The following are the practical results given by Dr. Wallace, of Glasgow, of analyses of their Lochore and Capledrae Cannels:—

	Sample worked at Capledrae.	Sample worked at Lochore.
Gas per ton of coal, at 60° Fahr. and 30 inches barometric pressure . .	13,095 cubic feet.	11,760 cubic feet.
Illuminating power, in standard sperm candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	32·91	34·83
Value of 1 cubic foot of gas in grains of sperm	780	836
Equivalent of a ton of coal in pounds of sperm candles	1,459	1,404
Durability of 1 cubic foot by 5-inch flame	69 minutes.	71 minutes.
Gravity of the gas (air = 1000)	596	594

Remarks.—This (the sample from Capledrae) is a Cannel Coal of first-class quality, giving 13,000 feet of 33-candle gas. It contains only a minute proportion of sulphur, and the ash is almost quite white. The coke is of rather inferior quality.

Remarks on Sample from Lochore.—This is a Cannel Coal of first-class quality, giving a large yield of very rich gas and a coke of medium quality.

2. The following are the practical results of analyses by Dr. Wallace of the Company's Waverley Cannels:—

	Capledrae Waverley.	Lochore Waverley.
Gas per ton of coal, at 60° Fahr. and 30 inches barometer	9,120 cubic feet.	11,145 cubic feet.
Illuminating power, in standard candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	36·62	33·09
Value of 1 cubic foot of gas in grains of sperm	878	794
Equivalent of a ton of coal in pounds of sperm candles	1,145	1,264
Durability of 1 cubic foot of gas by 5-inch flame	80 minutes.	67 minutes.
Gravity of the gas (air = 1000)	677	597

Remarks on the Sample of Capledrae Waverley.—This Coal gives fully 9000 feet of gas of 36½ candles, and is admirably adapted for bringing up the quality of gas made from common coal or inferior qualities of cannel. The tests were made at a rather high temperature, this being one of the coals that stand a very high heat without serious diminution of the illuminating power of the gas The coke contains 60 per cent. of ash, and is therefore almost valueless, but the proportion of sulphur is very moderate.

Remarks on the Lochore Waverley.—This is a first-class Cannel Coal, giving 11,000 cubic feet of 33-candle gas. The quantity of sulphur is very minute, and the ash is nearly white. The coke is of inferior quality, but not wholly valueless.

Applications for full Copies of Analyses and Prices may be made to the Company, at

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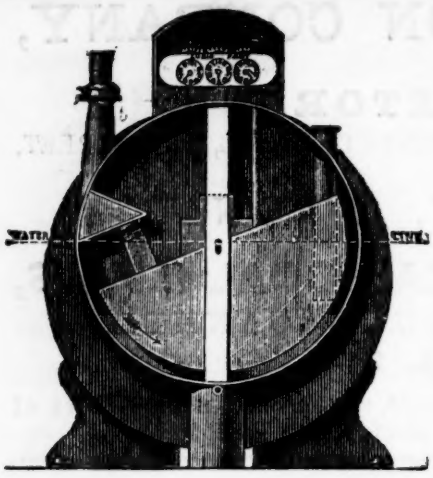

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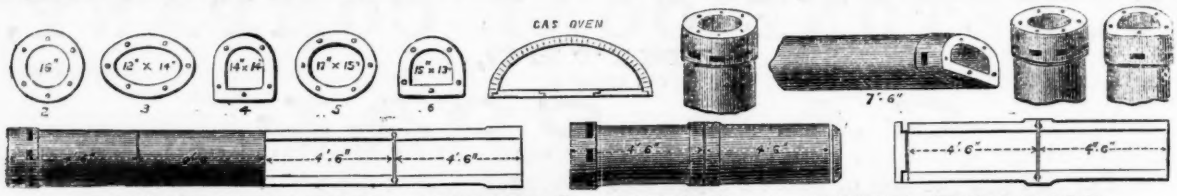

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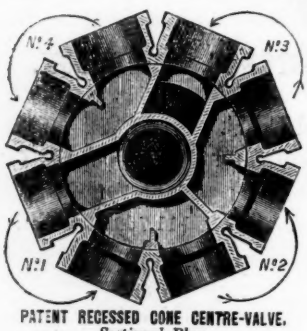

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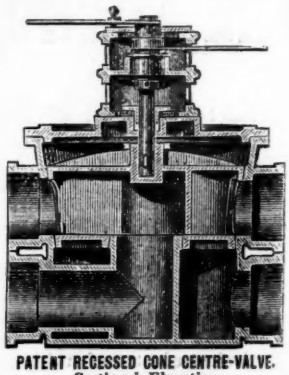

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